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BOSTON

JOURNAL OF NATURAL HISTORY,

CONTAINING

PAPERS AND COMMUNICATIONS,

READ TO THE

BOSTON SOCIETY OF NATURAL HISTORY,

1850—1857.

PUBLISHED BY THEIR DIRECTION.

VOL. VI.

MISSOURI
BOTANICAL
GARDEN.

BOSTON:
GOULD AND LINCOLN,
MDCCCLVII.

PUBLISHING COMMITTEE:

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RIVERSIDE, CAMBRIDGE:
PRINTED BY H. O. HOUGHTON AND COMPANY.

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JOURNAL OF NATURAL HISTORY.

VOLUME VI. — NO. I.

ART. I. — *On the Embryology of* Nemertes, *with an Appendix on the Embryonic Development of* Polynöe; *and Remarks upon the Embryology of* Marine Worms *in general.* By E. DESOR.

THERE is no group of animals the true affinities of which are more difficult to ascertain, than the so called white-blooded Worms. Not only the family, the order, but the class, and even in certain cases the department to which they belong is doubtful. Some light might therefore be expected from the study of their embryological development, according to the principle that each type in the animal kingdom follows, in this respect, a rule of its own. This consideration, together with the interest that attaches itself naturally to all inquiries in embryology, induced me to follow out the development of the Nemertes.

The Nemertes are marine worms of a very simple appearance, having no external gills, and no appendages of any kind.[1] Some of them are very long and ribbon-shaped, like Tænia;

[1] The anatomy of Nemertes has been investigated with great care, by the able French naturalist, M. De Quatrefages. (See Cuvier, Regne Animal illustré.) The species of the coast of Great Britain have been thoroughly described by Mr. Johnston in the Magazine of Zoölogy and Botany.

others are slender, like a thread ; but the greater number are small and similar in shape to the common earth-worm. Among the species of this type found on the shores of New England, there is one very similar to the *Nemertes olivacea* of Johnston. It is one and a half to two inches long, and has the same dark green color, but without the red head, wherefore I shall designate it under the name of *Nemertes obscura.* (Fig. 1.) It lives under stones and among sea grasses on the shore, between low and high water mark. Several specimens of this species were procured in East Boston, towards the end of January 1848 ; they were kept in a jar, where they lived several months in a very healthy state, care being taken to renew the water every day. On the 12th of February, there was observed at the bottom of the jar a yellowish gelatinous string, (fig. 2), which was found to consist of eggs. It had been laid during the night, and was remarkable as being almost as large as the parent animal. On examining it with a magnifying glass, (fig. 2*a*), I was struck with the irregular distribution of the yolk-spheres. Instead of being isolated and surrounded each by an independent albumen-like liquid, I found several of them collected together in transparent gelatinous bags, which seemed to be attached to a central string by a kind of neck or stalk, like a bunch of onions. The bags themselves are generally spherical, with the exception of the terminal ones, which are elongated and truncated at their base. The stalk by which they are attached is hollow, and the whole body bears a striking resemblance to a Florence oil flask, (fig. 3,) whence in future I shall call them *flasks.*

The number of yolks enclosed in a flask is generally three or four, seldom more than six or less than three. I have seen nevertheless, some containing ten and even as many as eleven, and on the other hand, some with no more than one, in which

[1] The same peculiarity is found in several species of Eolis, where there are commonly three or four yolks in one egg.

case the sphere is generally larger. Lastly some were found at the extremity of the string containing no yolk at all, but merely a transparent liquid. When crowded together, the yolks, which by themselves are spherical, become flattened at the points of contact, showing that they are of a soft consistence. The transparent liquid, with which the yolks are surrounded, is similar to that found in the eggs of molluscous animals, which is commonly called albumen, from its similarity to the white of eggs in higher animals. But physiologically speaking, it is in neither case a true albumen, though it may contain albuminous matter. It is nothing more nor less than the *mother liquid*, so to speak, which becomes transparent as the vitelline matter condenses, and which I propose to call *biogen liquid*, in consequence of its great importance in embryology.[1]

The germinative vesicle and germinative dot, which are so distinct in the ovarian egg,[2] have completely disappeared after its extrusion, at least I never was able to discern it after the egg had been laid; in place of it, we find in each yolk-sphere one or several clear or semi-transparent spots, not having a well defined outline, and which have been described by embryologists under the name of oil-drops, or clear dots. (Fig. 3–13.)[3]

[1] See Proceedings of the Boston Soc. Nat. Hist. 5th July, 1848.

[2] See Johnston, Miscellanea Zoölogica, in the Magazine of Zoölogy and Botany, Vol. I. Pl. 17, Fig. 2 and 6. According to Johnston, the eggs are found in little masses on each side of the alimentary canal.

[3] Considering the different opinions as to the nature and object of these spots, I have devoted myself with great care to their examination, hoping that they might throw some light on this difficult question. The following are the results of my observations.

On compressing the flasks, there are seen on the margin of the vitelline spheres little transparent vesicles like herniæ. (Fig. 4 *a* and 5 *a*.) Considering their sharp outlines I was tempted at first to consider them as vesicles, but seeing that on increasing the pressure they elongated their form, and that a large vesicle divided into a number of small ones having the same sharp outlines, (fig. 6 *b* and 7 *b*), my first impression was changed, and it seemed evident to me that it was a viscous liquid, which, from the cohesion of its particles, took these well defined forms, as we see in a drop of oil. In a second experiment made upon another mass of eggs, I ob-

The vitelline substance is not a homogeneous mass, nor simply granular, as it appears at first sight; on the contrary, it is composed of an accumulation of cells, which are distinctly nucleated, as may be shown by a magnifying power of only 150 diameters, and which is very plain in a power of 400 (fig. 8.) So long as the vitellus is entire, the cells being pressed against each other, have an angular form; but as soon as the vitellus is broken, they become spherical. Each cell contains, usually, but one nucleus, which also seems to be a cell; at least, it is transparent like the cell itself, (fig. 8.)

At this epoch of the development, that is to say, before the furrowing has began, there is no trace of a membrane to be observed around the yolk-spheres. It seems that the natural cohesiveness of the vitelline substance is sufficient to maintain it in a spherical form. The oily drop in the interior may even be forced out without breaking the vitellus. In order to break

served the following: A flask containing several vitelline masses was placed under the compressorium, and on compressing with great care, I succeeded in bursting, in a gradual manner, one of the vitelline masses in which the clear spot was very distinct. While the vitelline substance was escaping, the dot became isolated, (Fig. 8 *d*), and although I used a high power, (400 diam.) I could not perceive any trace either of a nucleus or any other body in it. Nevertheless, the vesicle could be moved in any direction with great ease, so that I even saw it escaping from the flask and rolling in the current of the vitelline substance. It had an extraordinary flexibility, bending and twisting itself against every obstacle which it met, assuming the most varied forms, as shown in Fig. 9–12. This extraordinary flexibility, taken in connection with the fact that I could not perceive any investing membrane, convinces me that it was a mere *drop of oily cohering fluid.*

Another vitellus having been crushed more rapidly, I could not perceive any large vesicle, but in place of it many small clear spots having the same limpid appearance, without any nucleus, from which I concluded that the large drop had been broken into many fragments, as in the case shown by Fig. 6 and 7.

These experiments I think authorize the conclusion, that the clear spot is formed by a transparent oily liquid, which assumes a spherical form, in consequence of its molecular cohesion. Moreover the impossibility of discovering any kind of membrane, and the fact that it may be broken into many smaller drops of similar appearance, without any previous appearance of partitions, seem to me sufficient to prove that at this early period at least, there is no envelop, and therefore that the oil-drop is not a true cell, as has been maintained by some authors. It remains for future investigation to make out what is its object and signification in the economy of nature.

it, it is necessary to compress it more or less, and then it will be seen torn open like a mass of jelly.[1]

The absence of a peculiar membrane surrounding the vitellus will not surprise us, if we consider that the transparent liquid contained in the flask is not similar to the albumen found in the eggs of higher animals, but belongs more properly to the vitellus itself; so that the membrane surrounding it is the true representative of the vitelline membrane, or chorion of the higher animals, and by no means the representative of the shell-membrane.

The furrowing of the vitellus begins as early as the third, and even sometimes the second day. The most striking appearance, as distinguishing this from other animals, is the great irregularity of the divisions. We find nothing of the almost geometrical progression and external regularity that exists in many mollusks and fishes. At first, we see a few folds form on the border of the vitellus, which divide it into irregular lobes, as seen in fig. 13. It is important to remark, that in this state the clear spot is undivided. It is plain, therefore, that the division of the yolk is in no way dependent upon the transparent spot; at least, that it is not occasioned by a previous division of the latter. In this respect, my observations confirm completely the results obtained by my friend Dr. Vogt, as to the development of the Actæon.[2]

The furrowing goes on gradually, till the whole mass is divided into a number of fragments of irregular size and shape, as seen in fig. 14, which shows one of the flasks on the fifth day. At this time each fragment shows a clear spot which is smaller than the single spot in an undivided yolk. Nevertheless, the sum of these spots seems to represent a larger mass than the primitive spot. Their form is spherical, as is ascertained by the following experiment. Having compressed the

[1] The vitelline granules being very cohesive in the Nemertes, it often happens, that when escaping, they adhere to each other and form balls, which might easily be mistaken for large cells.

[2] See Annales des Sciences Naturelles. 1846.

flask, (fig. 14,) I saw the yolk granules escape from one of the divisions, leaving untouched the clear spot, which now appeared as a well-defined drop, (*a*). At the same time, one of the three yolks broke, and I saw that the divisions, which till then were angular, assumed ovoid or spherical forms, (*b*.)

On the sixth day I found the divisions much farther advanced, and the yolks assuming the mulberry form, as shown in fig. 15. The yolks were still crowded together, especially in those flasks containing many yolks.

On the succeeding days, the subdivisions continued to progress, so that the yolks appeared to consist of small granules, fig. 16 representing a flask on the ninth day. A remarkable point about this flask was, that whilst the two upper yolks were exceedingly subdivided, the lower one, (*a*), was almost homogeneous, with a single large transparent spot, and had merely commenced its subdivision, showing that it had been arrested in its development. The simultaneous existence of this undivided yolk, having a single large clear spot, with two other yolks much subdivided, and having no single large spots but only the small ones in each granule, induced me at first to believe, that the small clear spots owed their origin to the subdivision of the large one, as is generally supposed; but having seen in other specimens the simultaneous existence of both kinds, (fig. 15,) I was convinced that this idea was not correct as applied to the Nemertes, and that there must be an increase of the transparent liquid during the development.

On applying pressure to the flask of fig. 16, the upper yolk burst, and I saw the granules escaping in the form of little spheroids, each having its clear spot, which appeared to occupy one-fourth, and sometimes one-third, of its bulk, (*b*.) The granules were now surrounded each by its own membrane, so that on the death of the egg the yolk decomposed into as many spheres as there are divisions.

It is not uncommon for small parts of the vitellus to separate from the mass, during the course of the development,

and consequently we see, in most of the flasks, small bubbles floating about, as has been observed in many mollusks, and even in mammals. These bubbles seem to preserve a kind of separate life ; at least, they do not decompose, and we find them even in those flasks whose embryos are far advanced, (fig. 18 and 20.) They are always surrounded by a distinct membrane, and contain a certain number of small granules ; but I never saw them assuming any other form than that of simple vesicles, destitute of ciliæ.

At about the fourteenth day the yolks begin to move.[1] When observed with a high power, I found them covered with very minute ciliæ, their organs of motion, (fig. 17.) They move at first very slowly and irregularly, revolving about their own centre. The liquid in which they revolve does not seem to offer much resistance, from the apparent ease with which they push about the little bubbles contained in their enclosure with them. When a flask is broken and the yolks have escaped, they continue to agitate their ciliæ, and to move as well in the water as they did in the liquid contained in the flask. This is a sufficient proof that this motion depends upon inherent power, and is not the result of mere external influences, such as difference of density.

About this time the yolks, which until now had seemed quite homogeneous, begin to change their appearance. We perceive in the interior a very transparent spot, lying transversely, and which must not be confounded with the clear spots heretofore spoken of, from which they may easily be distinguished by their peculiar shape and sharper outlines, (fig. 18.) Upon the application of pressure, the crescent becomes larger, and very distinct, (fig. 19.)

We now also perceive two separate zones in the embryo, the external one being clear, and the internal more opaque. The external zone becomes more and more distinct, so as to

[1] In one flask, taken from another mass of eggs, I found motion by the twelfth day.

be recognized even when not compressed, as seen in fig. 20, representing a flask on the 18th day. The crescent-like spot is enlarged, the ciliæ are more distinct, and the embryos revolve more rapidly than before.

Some days after, when compressing the yolks, I noticed the existence of a third zone, that was interposed between the two others, (fig. 21); so that there were now three distinct layers in each yolk. The external one, being quite wide, showed very distinctly the subdivisions of the yolk substance, with the clear spot in each granule; the second was the most transparent, and there were seen in it very small and delicate transparent cells; the third or interior one, being the most opaque, with a quite distinct granular structure similar to that of the external zone, but more dense.

The embryo remained in this state until about the 24th day, when I noticed a most unexpected and extraordinary change, which, like a ray of light, made clear to me the signification of the different zones above alluded to, and at the same time revealed to me a new kind of development, hitherto unknown to embryologists. On putting some flasks under the microscope, I was astonished to see that in one of them there was, besides two yolks revolving in the usual manner, a third body, that had quite a different motion, elongating and contracting spontaneously, sometimes advancing and sometimes retreating. (Fig. 22 *a.*) It was surrounded with ciliæ as the others, but had only two zones, the external one being wanting, and in the place of the crescent, there was seen a lanceolate spot, conforming in its longest diameter to that of the yolk. There were also observed in the flask several irregular fragments of yolk-like substance, which I had not noticed before, and which, judging from their appearance, could be nothing else than the remains of the external zone, which was no longer to be seen around this embryo, whilst it was distinct around the others.

How had this disengagement taken place? Was it the normal result of the development, or was it only accidental?

On turning my attention to the other two yolks, these questions were at once answered. Having compressed them so as to force them out from the flask, I saw distinctly the three zones above described, (fig. 25) ; but the external zone was separated from the next zone by an empty space, (*a*), and I could see distinctly that there was an internal motion and contraction quite independent of the revolving of the whole yolk. On looking more closely, I could see, farther, that the margin of the second zone was covered with very minute ciliæ, (*b*). From this moment I no longer doubted that this internal motion was made by the animal itself, and that the external zone was nothing but an envelop, which is cast off by the animal when it approaches the completion of its embryonic development. I saw it indeed burst under the pressure, and fragments of it fall off, as represented in fig. 26. In another instance I saw, and had the good fortune to show to several of my scientific friends in Boston, the embryo trying to escape from this envelop, (fig. 27), which it succeeded in doing after a while, and was then seen dragging after it the fragments of the external zone, as is represented in fig. 28.

The various zones are not only distinct in their external appearance, but moreover composed of very different tissues, as will be seen by fig. 31, representing, on a large scale, a transverse section of the embryo of fig. 27, according to the line *a b*. The outer zone, (*m*), which is rather dense, is composed of large cells, apparently irregular, but becoming spherical on being isolated, (*x*), each of them having a transparent centre. These cells are nothing but divisions of the yolk, as I have already described and figured them in fig. 16. It seems therefore that this part of the yolk has undergone no visible change since that epoch, except the appearance of ciliæ on its surface.

Within this outer coat we find an empty space, narrow, but nevertheless sufficiently large to allow the embryo to move. Inside of it is seen a transparent zone, (*n*), covered with ciliæ, this being the real body of the animal. It contains clear cells

of different sizes, but all spherical and nucleolated. The margin of this part only is bordered with angular epithelial cells, to which are attached the ciliæ. Inside of this is another large mass of cells, (*o*), similar to those of the outside, being without doubt the residue of the vitellus destined for the support of the animal. When isolated, (*z*), they are spherical, and contain likewise a clear spot, which nevertheless is less distinct than in the cells of the outer coat, and is sometimes completely wanting.

As soon as the animal leaves its envelop, it moves with great ease in all directions, bending and contracting itself as it pleases. When elongated, (fig. 22 *a*), there is seen, as we have already stated, a longitudinal clear stripe, extending upwards from the inside yolk, (*c*). If the animal contracts itself, (fig. 24), this stripe becomes so much shorter as to appear transverse instead of longitudinal. This fact convinced me at once that this stripe was nothing more nor less than the crescent-like spot, formerly spoken of, in an elongated state, being *the first appearance of the alimentary canal.*

The animal moves with as much ease when taken out of the flask and placed in water as before, showing that the change of medium has no effect upon it. It appears perfectly master of its movements, and on seeing it swimming about, and striking against different objects, one might suppose it endowed with a certain amount of curiosity. Sometimes, also, I saw them shake themselves convulsively, as if they had a chill.

Commonly, the embryo does not leave the flask immediately after having freed itself from the envelop; on the contrary, it remains there sometimes for days. The changes which now take place, on about the thirtieth day, concern principally the internal parts. The residue of the yolk not only diminishes in volume, but becomes less and less opaque; the intestine likewise becomes more distinct; it assumes now the appearance of a proper tube, which extends from the vitellus to the upper part of the body, and is seen even to

enter into the vitellus, (fig. 29.) A few days later, the yolk residue is nearly transparent ; the part of the intestine seen in it generally appears bent ; and, besides this, there is seen near the posterior extremity a large clear spot, which indicates probably the anus, (fig. 30.)

My observations were here brought to a close, it being impossible to pursue the further development of the young Nemertes, when escaped from the flasks, in consequence of their small size, and the difficulty of preserving them alive.

RECAPITULATION.

The main point in these researches is the fact, that a large portion of the yolk is transformed into an envelop, which surrounds the embryo during the first phases of its existence, and which is then cast off by it when it becomes able to move by itself. This liberation of the embryo from the envelop must not be confounded with the casting off of a mere external membrane, like the shell membrane, or like the placenta of the mammalia. Indeed, the placenta, as we know, is formed of a combination of the chorion or vitelline membrane with the maternal organs. The envelop of which we speak is not the product of the vitelline membrane ; it is an integral part of the yolk itself.[1]

The liberation from this envelop is by no means a substitute for the process of hatching, which takes place as regularly in the Nemertes as in any other animal. Indeed the embryo which throws off its envelop is not hatched by this process. We have shown, on the contrary, that it continues to remain for some time after its liberation in the common egg, which has been designated under the name of *flask*, and it is only when leaving it, that we can consider it as hatched.

Consequently the presence of an envelop forming an

[1] One might be induced to compare this liberation from the envelop with the moulting of caterpillars ; but it is to be remembered, that in moulting, it is the skin that is concerned ; that is to say, a portion of the animal composed of organized tissue, whilst the envelop of the Nemertes has not yet arrived at this state, but seems to be merely yolk substance.

integral part of the vitellus, and being for a time the seat of a peculiar motion, should be considered as a peculiar evolution of animal life, which though unnoticed until now, deserves none the less to be taken into serious consideration.

Another point of no less importance is the existence of *two kinds of ciliary motion*, distinct from each other, and which, though simultaneous, are independent. While the vitelline sphere, as a whole, *revolves*, the embryo within is endowed with a peculiar motion performed by means of ciliæ, similar in their appearance to those of the envelop, and which continue the same motion after the animal is hatched. Therefore, there can be no doubt that this motion is a true *voluntary motion*. The ciliæ of the envelop in this respect are essentially different, and their motion may be considered as *merely organic*, similar in some respect to that of mucous membranes.

Ciliary motion ought therefore no longer to be considered as a peculiarity of certain classes of animals, neither ought we to look at it as being exclusively connected with certain functions. It is a general motive agency that nature adapts to all sorts of functions, particularly to locomotion among the lower animals, and also among many higher animals in the embryonic periods of their life.

ON THE DEVELOPMENT OF POLYNOE.

Extraordinary as the development of Nemertes may appear, it is not without some analogies in other Worms. We would especially refer to *Polynöe squamata*, an Annelid very common on both shores of the Atlantic. To my friend M. Lovèn are due the first investigations of the development of these worms.[1] His observations have lately been completed by M. Sars, the distinguished Norwegian embryologist,

[1] Several specimens were exhibited by Prof. Agassiz before the American Academy, in this state.

who has taken up the history of these animals from the first period of their development,[1] showing that at the spawning season, the eggs fill nearly the whole cavity of the animal, being of a purplish tint, and showing distinctly the germinative vesicle. When laid, the eggs are found deposited under the scales of the back, where they are kept in place by an adhering membrane. There they pass through the first stages of their growth, namely, the subdivision of the yolk, which is followed by the first appearance of the germ, both of which take place in a very regular manner. After a while, ciliæ appear on the surface of the yolk, which enable the eggs to move by jerks. These ciliæ grow rapidly, while the embryo changes its color from pink to green. When they have arrived at this stage, the embryos leave their retreat simultaneously, and begin to swim freely in the water.

It is at this period that I found, last February, thousands of little green spots moving with great rapidity in a jar, where there were several Polynöe kept. Having examined them with the microscope, I was struck, like M. Sars, to see that they had not the least resemblance to their parents. They were small spherical bodies, surrounded with a ring of long threads, (fig. 36,) by means of which they spun round, all the time changing their places, sometimes starting in a straight line in one direction, sometimes describing parabolic lines, and then stopping short and spinning round like tops.[2] Sometimes also, instead of spinning on their own axes, they turned somersets, and then it was easy to perceive that the threads formed a regular ring, (fig. 37.) When the spheres spun around, I saw at the base of each thread an enlargement, which is simply a fold of the membrane to which the threads are attached, as is plainly shown in the enlarged sketch of fig. 39. The movement of the threads resembles that of a whip-lash, the middle part bending first.

I was surprised to find such rapid and extraordinary motion in the progeny of an Annelid, and though it appeared quite

[1] Wiegman, Archiv. 1836.

[2] Wiegman, Archiv. 1846.

spontaneous, nevertheless it seemed to me different from the motion of any embryo with which I was acquainted. Their manner of moving was abrupt and jerking, somewhat unlike voluntary motion, but which reminded me strongly of the motion of the sporules of Confervæ, which I had formerly observed at Neuchatel, and described in the Proceedings of the Helvetian Society.[1]

The motion of the embryos seems to be incessant, as long as they have plenty of water to swim in, but the rapidity is variable.[2] On placing them on the glass so as to leave them nearly dry, I succeeded in stopping them for a moment. What was my astonishment when I saw that the two red spots, which are visible very early, (fig. 36), were not situated on the surface, but belonged to an embryo that was lodged inside of this moving sphere, (fig. 38), and had an independent motion. With the help of the two red spots I could easily ascertain the real position of the embryo. The next day the embryo was more defined, (fig. 40), and I could distinctly see it contracting itself inside of the sphere,[3] like the embryo of the Nemertes in its envelop.

The embryos remained in that state for several days, when I saw that their motions were more sluggish; some of them remained even motionless at the bottom of the vase. On examining them in that state, I found that the envelop was torn, the threads were hanging down, and there was a swelling like a large hernia projecting, (fig. 41.) I soon perceived that it was the embryo about to escape. This operation is not performed without some difficulty, if we may judge by the amount of time that is necessary for the embryo to disengage itself, (sometimes 5 and even 10 minutes.) It is worth notic-

[1] Actes de la Société Helvétique des Sciences Naturelles, 1838.

[2] M. Sars also saw the vitelline spheres move by means of their long threads, but as he did not distinguish the external envelop from the embryo in the interior, he considers these threads as belonging to the embryo itself, and compares them with the *cirrhi* that surround the head of the embryo in the Nudibranchiate mollusks, whereas the real ciliæ of the animal inside are considered by him as simple vibratile ciliæ.

ing that the embryo always escapes tail foremost, this being completely free, whilst the head and eyes are within the envelop, (fig. 42.) Around the embryo are seen opaque grains of yolk, which remain in the envelop when it is cast off, (fig. 43 *a.*) As soon as the embryo is completely free, (fig. 43), it begins to creep, but its motions are very sluggish when compared to those of the envelop.[1]

I could not succeed in prosecuting the inquiry farther, since the embryos fell a prey to a species of Infusoria (Leucophrys), which is very voracious, and was at that time very numerous.

CONCLUSION.

It follows, from the above statements, that the embryonic development of Polynöe agrees with that of the Nemertes in the very point we have considered as the most prominent, viz. the fact that there is an envelop which, after having for a time protected the progeny, and afforded to it the means of revolving, is cast off, thus allowing the embryo to become entirely free. And as this mode of development is quite different from that observed in the other classes of Articulata, especially the Insects and the Crabs, we may fairly expect that when more extensively investigated, the embryology of the worms will afford us the means of a better and more natural classification than that which is derived merely from the anatomy and external features of the full grown animal.[2]

This is not the place to discuss any of the general questions to which these investigations into the embryology of the lower animals give rise, if considered in a philosophical point of view, especially in regard to animal individuality. Hith-

[1] A somewhat similar development has been observed by M. Siebold in the embryology of an intestinal worm (*Monostomum mutabile.*) There the progeny, when hatched, is likewise surrounded by an envelop covered with ciliæ, (fig. 33,) by means of which it moves about. By-and-by this envelop is cast off, giving birth to a sluggish worm of a quite different appearance, (fig. 32 and 33.) But there is this difference, that the envelop seems to be more highly organized, having even eyes (*a*) that are thrown off with it.

[2] Thus we shall have occasion to show, in a future paper, that Planaria, which is generally ranked by the side of the Nemertes, is totally different in its embryology.

erto, independent motion has generally been considered as the strongest criterion of animal life, and in order to sustain this view, naturalists have attempted to establish various arbitrary distinctions between animal motion and that of certain seeds, especially the sporules of Confervæ. Now we have here vitelline spheres that move in a manner of their own, different from that of the animal within, and, as it seems, under the influence of a power quite independent of the control of the animal, though the means by which this motion is performed are similar, that is to say, by ciliæ, like those of the animal itself. We may, therefore, conclude that this is a motion, which, though dependent upon life, does not belong essentially to the individual.

The foregoing investigations were made in East Boston during the months of February and March, 1848, with a microscope belonging to Professor Agassiz, with whom I had the pleasure of discussing several of the results obtained. An abstract was communicated to the Boston Society of Natural History at the session of the 5th of July, 1848. To my friends, Dr. S. Cabot and Elliot Cabot, Esq., I am highly indebted for many valuable suggestions, and also for having had the kindness to revise the proof of this paper.

EXPLANATION OF THE PLATES.

(*The magnifying power is 50 diameters when there is no higher power indicated.*)

Plate I. Fig. 1. *Nemertes obscura*. Desor. Nat. size.

Fig. 2. String of eggs of Nemertes obscura. Nat. size.

Fig. 2. *a*. The same 10 times magnified, to show the disposition of the flasks.

Fig. 3. A single flask, with four yolks. 50 diam.

Fig. 4 and 5. Single yolks compressed, showing the oily liquid in form of a hernia, *a*, on the margin.

Fig. 6 and 7. The same yolks more compressed, so as to divide the herniæ into several small drops (*b*).

Fig. 8. Portion of a flask 400 times magnified, showing the cellular

structure of the yolk granules and the oil drop (*d*) inside, being isolated by pressure.

Fig. 9–12. The oil-drop isolated in various shapes, showing its elasticity.

Fig. 13. A flask on the third day, showing the beginning of the division, the oil-drop being still undivided.

Fig. 14. A flask 5 days old. The division is more advanced. When a yolk breaks (*b*), each division is an independent sphere, having a clear spot inside.

Fig. 15. A flask 7 days old. The division is still more advanced; the yolks are flattened at their points of contact. In one of them the primitive oil drop is preserved (*a*).

Fig. 16. A flask 9 days old. The yolks are so divided as to assume the mulberry form. One of them (*a*) is retarded in its development, showing merely the beginning of the division with the entire oil drop (*a*).

Fig. 17. A flask 12 days old. The embryos are surrounded with little cilia, by means of which they revolve.

Fig. 18. A flask 15 days old. The embryos have inside a clear crescentic spot, the first indication of the intestinal tube.

Fig. 19. One of the embryos compressed, showing that it is composed of two zones.

Fig. 20. A flask 18 days old. The difference of tissue is obvious in all the embryos.

Fig. 21. A single embryo from another flask of the same age, compressed, showing three distinct zones.

Plate II. Fig. 22. A flask 24 days old. The external envelop has fallen off in one of the embryos, allowing it to move freely in the flask.

Fig. 23. An embryo, after having escaped from the flask, in an expanded state, showing the crescentic spot (*c*) in an elongated form.

Fig. 24. The same embryo contracted.

Fig. 25. An embryo inside of its envelop, the cilia being distinctly visible inside.

Fig. 26. An embryo whose envelop is falling off.

Fig. 27. An embryo at the moment when it escapes from its envelop. (80 diam.)

Fig. 28. The same dragging its envelop after him. (80 diam.)

Fig. 29. An embryo 30 days old; showing the intestinal tube running along the body. (80 diam.)

Fig. 30. An embryo 34 days old. The intestinal tube is bent inside of the yolk residue, which becomes more and more transparent. (80 diam.)

Fig. 31. Section across the embryo of fig. 29, in order to show the structure of the different zones, (400 times magnified); *m*, external envelop;

n, body of the animal; *o*, the residue of the vitellus; *x*, single cell of the outer envelop; *z*, single cell of the yolk residue.

Fig. 32–35. Monostomum mutabile, after Siebold.

Fig. 32. The embryo enclosed in the egg; *a*, the external membrane of the egg; *b*, the envelop; *c*, the embryo inside; *d*, the eyes.

Fig. 33. The embryo surrounded by its envelop.

Fig. 34 and 35. The embryo, after having left the envelop 34, in profile; 35 in front.

Fig. 36–43. Embryos of Polynöe squamata, (50 times magnified.)

Fig. 36. The embryo immediately after being hatched; showing the ring of long cilia.

Fig. 37. The same seen in profile.

Fig. 38. An embryo of the second day after being hatched.

Fig. 39. Portions of an embryo, showing the form and the motion of the cilia (80 diam.)

Fig. 40. An embryo three days old.

Fig. 41. An embryo four days old, when ready to cast off the envelop.

Fig. 42. An embryo at the moment when it casts off its envelop.

Fig. 43. An embryo after having cast off the envelop.

Fig. 43. *a*. Remains of the envelop.

Art. II. — *Descriptions and Figures of the Araneides of the United States.* By Nicholas Marcellus Hentz, Tuscaloosa, Alabama.

[Continued from Vol. V. page 479.]

Tribe IV. MAMMULOSÆ. *Abdomen with various projections.*

31. EPEIRA ? PENTAGONA.

Plate III. Fig. 1.

Description. Varied with yellowish and whitish, marked with black spots; cephalothorax elongated, external eyes separated; abdomen with four tubercles; feet 1. 2. 4. 3., the first and second much the longest.

Observations. This may constitute the type of a new

subgenus, as it makes a horizontal web. For the present it may be placed in my tribe of the *Ovatæ inclinatæ*.

Habitat. Alabama.

32. EPEIRA VERRUCOSA.

Plate III. Fig. 2.

Description. Purplish brown or black, varied with yellowish; body very soft; abdomen with a large triangular spot, glossy yellow or whitish; six or eight tubercles more or less prominent at the apex, sometimes with a white dot near their root; base with a tubercle on each side; feet annulated with brownish.

Observations. This species is very distinct, and not rare, usually preferring shady places, and the vicinity of waters.

Habitat. North Carolina. Alabama. July. October.

33. EPEIRA SCUTULATA.

Plate III. Fig. 3.

Description. Pale yellowish; abdomen in the form of an escutcheon; varied with orange, and yellow spots; two rows of black dots approximating towards the apex, and another row at base. A small species.

Observations. This species makes the common web, and remains above in a web of crossed threads like that of Theridium.

Habitat. Alabama. October.

34. EPEIRA INFUMATA.

Plate III. Fig. 4.

Description. Dusky gray; abdomen with two lunar spots and several abbreviated lines; bi-tuberculated at base; thighs tipped with black.

Observations. This spider is readily distinguished from any other by its form and color. The lateral eyes are placed nearer the edge of the cephalothorax than the middle ones, and this character is possessed by E. *stellata* (?), *prompta*, *hebes*, and *spinea*.

Habitat. North Carolina. Alabama.

35. EPEIRA HEPTAGON.

Plate III. Figs. 5, 6.

Description. Blackish; abdomen with an angular line on each side near the base, and several small irregular spots white or yellowish; seven or nine projections placed round the edge, the two interior ones largest, producing in their intervals seven or nine sides; two angular white spots underneath; male of a much lighter color, but with the same general markings.

Observations. This was first found in the clay tube of a Sphex *cyanea*, along with Epeira *alba* and thirty-eight specimens of Theridion *lineatum.* It makes a perpendicular web, and drops from it when threatened with the slightest danger.

Habitat. North Carolina, Alabama.

36. EPEIRA ALBA.

Plate III. Fig. 7.

Description. Cream white; abdomen with a tuberculated projection each side, anteriorly, a blackish spot between these, and two dots on the disc; legs with pale blackish rings.

Observations. Found in the clay nest of Sphex *cyanea.* It must be very rare.

Habitat. North Carolina.

37. EPEIRA CORNIGERA.

Plate III. Fig. 8.

Description. Yellowish; cephalothorax varied with yellow and black, with a bifurcated horn on each side, and many rounded tubercles; abdomen with two tubercles, one on each side anteriorly, and about eight impressed dots on the disc; feet deep yellow, two anterior pair sometimes annulated with piceous. A small species.

Observations. This very singular little spider obstinately holds its legs folded up as represented, in the manner of some coleopterous insects.

Habitat. Alabama. June, July.

Tribe V. SPINOSÆ. *Abdomen elongated with spines; feet, fourth pair longest.*

38. EPEIRA SPINEA.

Plate III. Fig. 9.

Description. Rufous; cephalothorax with a yellowish margin; abdomen with six spines; disc yellow, with black impressed dots; feet 4. 1. 2. 3.

Observations. This very singular spider usually makes its web in low bushes, and sometimes places them horizontally. It drops from its web, hanging by a thread, when threatened. Its nipples are borne on a projection, which is an impediment to walking on an even surface. The respective length of the feet depart from the character of Epeira.

Habitat. The Atlantic States, but rarely seen in the west.

39 EPEIRA RUGOSA.

Plate III. Fig. 10. 10*a*, 10*b*.

Description. Black; abdomen with ten spines on its edge above, and a large tubercle beneath; disc above with white spots, or white with many black dots and impressed punctures; sides rugose; feet 4. 1. 2. 3. Male very small, rufous; abdomen whitish, with a few blackish maculæ, long and slender without any spine.

Observations. This spider, closely related to E. *spinea* in many respects, makes also a web which is usually inclined, sometimes nearly perpendicular. Like that species, when thrown to the ground it moves with great difficulty, on account of the projection of the abdomen downwards. The departure from the characters of Epeïra, in the respective length of the legs, shows how wisely nature makes adaptation for each species. Were the fourth pair of legs shorter, the difficulty of motion would be still greater. In this respect particularly, it is related to Epeïra *mitrata*. A male was found attached to a female in July, like a pygmy upon a mountain, or rather under a mountain. He was so small that I thought at first it

was a parasite preying upon her; one of his palpi was deeply sunk in her vulva, and it was with great difficulty I could separate them. Their copulation in this respect is much like that of dogs.

Habitat. The Southern states.

40. EPEIRA MITRATA.

Plate III. Fig. 11.

Description. Pale yellowish or rufous; cephalothorax piceous, margin usually paler; abdomen pale yellow or white, varied with blackish spots and impressed dots above; sides rugose, two spines behind, and two smaller ones a little lower and nearer together, black, with yellow spots beneath and at the sides; feet rufous or piceous, joints paler at base, length 4. 1. 2. 3., or frequently 1. 4. 2. 3. Seldom large.

Observations. The abdomen of this singular spider viewed above resembles a bishop's mitre. Its cephalothorax is small and almost concealed by the base of the abdomen. It usually makes its web in low grounds in forests. Its second and third pair of legs are always shorter than the fourth and first, a character which departs from that of EPEÏRA, and which, with several others, it has in common with E. *rugosa.* It is not very rare.

Habitat. North Carolina, Alabama. August, October.

Tribe VI. STELLATÆ. *Abdomen short and wide, surrounded with short points.*

41. EPEIRA STELLATA? Bosc.

Plate III. Fig. 12.

Description. Pale brownish, cephalothorax varied with blackish; abdomen rugose, with dull gold colored hair, varied with marks and scolloped bands, and with fifteen conical spines, one before, one behind, and thirteen on the margin; thighs varied with black.

Observations. This singular spider always holds its feet drawn up towards the body, and seldom moves in the day-

time. The anterior spine is sometimes much longer and white. Dr. T. W. Harris, of Massachusetts, sent me one specimen with only thirteen spines. The cheliceres are very short and stout in this species.

Habitat. The United States.

42. EPEIRA CANCER.

Plate III. Fig. 13.

Description. Black; disc of the abdomen yellowish with black dots, circumference with conical black spines.

Observations. This little spider, described or rather delineated by Audubon in his Ornithology, makes perpendicular webs and is not rare in the south, but was never seen in the north.

Habitat. South Carolina. Common in South Alabama.

Tribe VII. CAUDATÆ. *Abdomen much elongated behind, in the females.*

43. EPEIRA CAUDATA.

Plate III. Figs. 14, 14*a*, 14*b*.

Description. Female, pale testaceous; cephalothorax piceous; abdomen with a conical projection behind, with many variable markings; joints of the feet tipped with dusky. There are also two tubercles on the disc of the abdomen which become obsolete in many, probably when the body is full of eggs.

Male, rufous; cephalothorax piceous; abdomen with two white dots and a white band above, which are wanting in some, and two white dots underneath; tip of anterior thighs black.

Observations. The variations in the form of this spider, and the difference between the sexes, had caused me to describe three species which must be referred to one. It makes a vertical web, on which it attaches its cocoons in a row, sometimes as many as five in number. These are of a brownish color, elliptical, and covered with the remains of the insects

which have been devoured by the spider. On examining five of these cocoons attached to the same web, young spiders were found already hatched in the lowest one; those above contained eggs not glued together. Whenever this spider is threatened, it imparts to its web a rapid oscillation, which causes the eye to lose sight of it. This is probably intended to escape destruction from the birds. The male never was seen with a web of his own, but was often found wandering.

Habitat. Common throughout the United States.

44. EPEIRA CAROLI.

Plate III. Fig. 15.

Description. Grayish; cephalothorax black; abdomen much elongated behind, blackish, with the disc grayish, varied with darker lines; feet varied with black, particularly the first and second pair.

Observations. It is not probable that this can be referred to E. *caudata*, though that species varies much in shape.

Habitat. Alabama. September.

Genus PHILLYRA. Mihi.

Characters. *Cheliceres very short; maxillæ short, parallel, truncated above; lip subtriangular; eyes eight, equal, all borne on tubercles, in two rows of four eyes each; the first nearly straight, placed on the very margin of the cephalothorax, the second arcuated towards the first, so that the external eyes are widely separated from those of the first; feet, the first pair larger and much longer than the rest, the fourth next, then the second, the third being the shortest.*

Habits. Araneïdes sedentary, making a horizontal web formed of spiral threads, crossed by other threads departing from the centre, and abiding on the web with its legs extended in a straight line. Cocoon cylindrical, tapering equally at both ends.

Remarks. This new subgenus is probably closely related to ULOBORUS of Latreille. The position of the eyes however

is reversed, and the legs are different. In several particulars is is related also to *Tetragnatha.*

The habits of the spider upon which I have established this new subdivision, are analogous to those of *Epeira.* Its web however is always horizontal. When threatened, it shakes its web violently and thus escapes the notice of its enemies. The attachment of the mother to her cocoon is really surprising. The web may be taken up with the cocoon attached; and the mother, unwilling to leave it, suffers herself to be carried with it, without manifesting the least fear. This may be enclosed in a box, and she will remain by it, apparently contented, if it is not torn from her care.

1. PHILLYRA MAMMEATA.

Plate III. Fig. 16.

Description. Brownish; abdomen with diagonal blackish lines more or less distinct; one tubercle on each side anteriorly; varied with brown and blackish underneath; anterior pair of legs very long and stouter than the rest; the antepenult joint with a tuft of blackish bristles above and below near the apex, and usually a pale ring at the base; the other legs varied with whitish and brown.

Observations. This spider makes a horizontal web, usually in cavities, among large logs, or in hollow trunks of trees. It shakes its web violently when threatened; and when at rest, being always under it in an inverted position, extends its legs in a parallel line, like *Tetragnatha.* Its cocoon is made in the shape of a double cone or cylinder, tapering at both ends. It is whitish, with veins of brownish black, and has many small, sharp tubercles. The mother watches it with an incredible perseverance, and cannot be separated from it by any inducement that can be offered. Fear seems to be wholly merged in maternal solicitude; and, as soon as the cocoon is torn from its place, having remained firmly attached to it, she proceeds to secure it with new threads.

Habitat. Alabama, in dry places.

2. PHILLYRA RIPARIA.

Plate III. Fig. 17.

Description. Whitish; cephalothorax with two longitudinal, brownish, narrow bands; abdomen with an interrupted longitudinal line and two lateral curved lines, blackish; one tubercle above near the middle on each side; feet varied with blackish, antepenult joint of the anterior pair with two tufts of bristles. Markings of the female pale and indistinct.

Observations. This was found on limestone rocks, on the banks of Cypress Creek. It certainly differs from P. *mammeata.*

Habitat. North Alabama, in moist places.

TETRAGNATHA. Latr.

Characters. *Cheliceres long, serrated, or with prongs; maxillæ parallel, very long, widening at the top, truncated; lip subtriangular, less than half the length of the maxillæ; palpi long and slender; eyes eight, subequal, in two nearly parallel rows of four each; feet long and slender; first pair longest, then the second, the third being the shortest.*

Habits. Araneïdes sedentary, forming a web composed of spiral threads crossed by other threads departing from the centre, and abiding on the web with their legs extended longitudinally.

Remarks. This subgenus is closely related to *Epeira*, and has nearly the same habits. The species composing it are readily recognized by their long legs extended upon their geometrical webs. They differ greatly in the length of their cheliceres, but in other respects constitute a natural subdivision.

1. TETRAGNATHA GRALLATOR.

Plate IV. Figs. 1, 2.

Description. FEMALE: Testaceous, abdomen livid above, with a scolloped longitudinal darkish band, darker beneath, with a black longitudinal line and two yellow longitudinal

ones. Cheliceres with two rows of teeth, one larger near the apex. Male: Wholly testaceous or livid. Cheliceres much larger, arched, with two rows of teeth and three large prongs; one superior, bifurcated at the end.

Observations. This spider makes its web on bushes on the margin of springs and rivers. When on a twig it extends all its legs in one straight line. Its web is scarcely ever perpendicular, but inclined, sometimes horizontal.

This may be the T. *elongata* of Bosc; but as the name may apply to my T. *laboriosa*, there will be less confusion in using this appellation.

Habitat. Pennsylvania, North and South Carolina, Alabama, &c.

2. TETRAGNATHA LABORIOSA.

Plate IV. Fig. 3.

Description. Rufo-testaceous; abdomen yellowish with black branching lines above; a black central longitudinal line, and two yellow ones beneath; feet and cheliceres of moderate length; male with the same marking; cheliceres larger but not as elongated as in T. *grallator*

Observations. This spider is found in meadows making the web of an Epeïra, and is not found on wet ground more than in dry places. It is very different from T. *grallator*, particularly in the position of its eyes, which in the male and female are placed in two sensibly curved rows; whereas in that species these rows are straight, the upper one almost bent the other way.

Habitat. United States.

Linyphia. Latr.

Characters. *Cheliceres moderately long; maxillæ short, parallel, wider and truncated at the top; lip very short, subtriangular; palpi slender; eyes eight, equal, four in the middle, nearly in the form of a square; two each side, placed together on a common elevation; feet slender, the first pair*

longest, then the second and the fourth, the third being the shortest.

Habits. Araneïdes sedentary, forming a compound web, composed of a horizontal one, which is surmounted by threads irregularly crossed; usually standing in an inverted position under the horizontal web.

Remarks. This subgenus is very readily recognized by its singular webs, observable on bushes and weeds, particularly in the morning when covered with dew. There is less ferocity in the spiders of this division than in any other of the family. It is the only subgenus in which the male and female may be seen harmoniously dwelling together.

1. LINYPHIA COMMUNIS.

Plate IV. Fig. 4.

Description. FEMALE: Cephalothorax rufous; abdomen purplish black above, with about five spots on each side, nearly united in the form of two longitudinal bands; farther down are about five smaller white marks; purplish black beneath; feet greenish brown, short. MALE: Rufous all over; more slender than the female.

Observations. This spider, one of the most common in the South, is familiar to every observer of nature. Its perfectly regular webs, when the dew is still on the ground, are seen in great numbers in the fields and gardens. The owner of each web is always found in an inverted position under the horizontal web, which is curved or hollowed downward. The males are very common in the spring, but disappear in the fall. I have observed two males on a web, fighting an obstinate battle; they strove to grasp each other with their cheliceres, and when exhausted by the conflict, they retired at some distance to rest themselves, and presently renewed the combat. I know not how the contest terminated, but I believe it was without bloodshed. During this, the female, who was the lady of the manor, remained very quiet and apparently unconcerned. The ferocious habits of spiders are

generally confined to the appropriate sex; for the females are so gentle that I have seen several allow the males to dwell in the same tent with them, the pair living decently together as husband and wife should among christian people. I saw but once a male alone in a web, and I do not know whether they ever weave one themselves. It is strange that I never saw the cocoon of so common a species.

Habitat. The United States, though somewhat rare in the North.

2. LINYPHIA MARMORATA.

Plate IV. Fig. 5.

Description. Cephalothorax rufous, with a whitish edge; abdomen black, with many bands, spots and dots; white with a tinge of yellow; beneath with a few slender white lines and a yellow band each side, interrupted in two places, so as to make about six yellow spots; feet dark green, long.

Observations. This is a very large species, and very distinct from L. *communis*, making very large webs, with long threads to secure them.

Habitat. Alabama. July — August.

3. LINYPHIA SCRIPTA.

Plate IV. Fig. 6.

Description. Cephalothorax blackish purple with a white edge; abdomen white, with curved spots and obsolete marks, purplish; feet pale greenish, long; a small species.

Observations. This species may be recognized in the fields by the peculiar form of its web; the horizontal part of which, instead of being curved or hollowed downward, as in L. *communis*, is rounded upwards, so that the spider stands inverted, as it were under a bowl. It is quite distinct from that species and from L. *marmorata*.

Habitat. Alabama. May — September.

4. LYNIPHIA CONFERTA.

Plate IV. Fig. 7.

Description. Cephalothorax yellowish, with an abbreviated blackish line; abdomen whitish, varied at the sides with greenish lines, with a longitudinal dusky band trifurcated towards the base; feet greenish $_{1.\,\widetilde{4.\,2.}\,3.}$

Observations. This spider makes a web with its curve upward, like an inverted bowl, and remains in its concavity in an inverted position. It was discovered and delineated by my son, Charles A. Hentz.

Habitat. Alabama.

5. LINYPHIA COCCINEA.

Plate IV. Fig. 8.

Description. Crimson or red; three last joints of palpi, area of the eyes, and tip of the tubercle of the abdomen, black; abdomen with a terminal tubercle above the anus; feet yellowish red $_{1.\,\widetilde{4.\,2.}\,3.}$

Observations. This species is not very rare in North Carolina, but has not been seen in Alabama. It may be readily distinguished from *Epeira rubens* by the form of its abdomen, and other characters.

Habitat. North Carolina.

6. LINYPHIA? AUTUMNALIS.

Plate IV. Fig. 9.

Description. Livid yellow; cephalothorax with a longitudinal band and margin dusky; abdomen with a double row of dots, connected with a longitudinal line; black above; an indented band blackish beneath; feet varied with dusky bands.

Observations. This little species, seen only in the North, may possibly be referred to *Theridion.* It makes a web with threads stretched in all directions, in the corners of walls, dark places, &c., and remains in the middle in an inverted position, like *Linyphia.*

Habitat. Maine and Massachusetts.

10. LINYPHIA ? NEOPHITA.

Plate IV. Fig. 10.

Description. Rufous brown; abdomen piceous; small a a male, feet 1. 4. 2. 3.

Observations. This small species was found running on the ground, and is placed with doubts in this subdivision. Its abdomen has no projection like *Linyphia coccinea,* and therefore it is not probable that this is the male of that species.

Habitat. North Carolina.

7. LINYPHIA ? COSTATA.

Plate IV. Fig. 11.

Description. Pale yellowish; cephalothorax with a slender blackish line bifurcating towards the eyes; abdomen with a serrated band and diagonal lines, brownish; feet hairy, varied with blackish; thighs with many blackish rings; feet 1. 2. 4. 3. One of the largest species; even larger than the drawing.

Observations. This spider may be separated from this subdivision by other naturalists, but the characters derived from its eyes, trophi, and feet, are those of *Linyphia.* It is only in the form of its web that it departs from it. It makes a large horizontal web, somewhat like that of *Agelena,* but without a tube; this is placed under broad leaves, such as those of hickory. The spider remains in an inverted position at one end, where threads are crossed irregularly, like those of *Theridion.* It does not endeavor to escape like *Epeira,* but is very easily taken. It probably does not make its cocoon in its web, as none were ever found. The male makes the same kind of web, and resembles the female.

Habitat. Alabama, all seasons.

MIMETUS. Mihi.

Characters. *Cheliceres very long, fang small; maxillæ tapering, inclined over the lip; lip pointed, triangular; eyes*

eight ; four in the middle, the two lower ones borne on tubercles and further apart than the two upper ones ; two on each side placed diagonally near each other, on a middle line ; feet long, the first and second pair much longer than the other two ; first pair bent in the female.

Habits. Araneïdes wandering, except during the time of the rearing of the young ; destructive of other Araneïdes, and invading their webs. Cocoon oblong, pointed at both ends.

Remarks. The parasitic habits of the spiders composing this subgenus, remind the naturalist of the depredations committed by various Hymenoptera upon many species of insects. The *Mimetus* can make a web like that of *Theridion*, but prefers prowling in the dark, and taking possession of the industrious *Epeira's* threads and home, or the patient *Theridion's* web, after murdering the unsuspecting proprietor.

It combines some of the characters of these two subgenera, but is more closely related to the latter. The extreme length of its cheliceres is quite anomalous.

1. MIMETUS INTERFECTOR.

Plate IV. Figs. 12, 13.

Description. Pale yellowish ; cephalothorax with a black band branching towards the eyes ; abdomen with several white spots near the base, varying in shape and size ; three central ones at base, often wanting ; a serrated black line on each side, almost uniting with its fellow at the apex, and several small transverse ones ; beneath pale, with little black marks as above ; feet very long, with long bristles, varied with rufous and black ; first and second pair with the penult joint curved. The male differs slightly from the female ; his legs being longer, and the penult joint of the first and second pair nearly straight.

Observations. This singular depredator is not rare, and is usually found in houses. This has enabled me to make many curious observations on its manners. The first specimen I found, was a female, which had made two cocoons

under a table in my study, near and among the webs of several of the *Theridion vulgare.* The cocoon differs in shape from that which is made by the last-named spider. It is oblong, and tapers equally at both ends, which are secured by many threads connected with a web like that of *Theridion.* Like one of this subgenus, the mother was watching the young, which were issuing from the lower cocoon. The second specimen observed was found devouring the eggs of a *Theridion vulgare*, most probably after having eaten the mother. The next day it had disappeared. A third one was found dead in the web of a *Theridion vulgare*, which no doubt had killed it. A fourth one was found eating that very same *Theridion.* This shows that these two species are mortal enemies. I never knew a spider of this species to remain more than two days in the same place. Its habits seem to be nocturnal; for generally, when discovered in the day-time, it is found in some dark corner, or crevice, with its legs folded in the manner of several species of *Epeira.*

I sometimes enclosed specimens of this spider-eater with other species of Araneïdes, in a glass jar, in order to watch its motions. The moment another spider was thrown in, it showed by its attitude that it was conscious of the presence of an enemy. It first moved its first and second pairs of legs up and down; then slowly approached its victim, and generally killed it. A *Theridion vulgare*, thrown in, manifested great terror; but after some seeming reflections on fortitude and necessity, it prepared for the mortal combat, and cautiously advanced towards the *Mimetus*, which moved more slowly. The *Theridion*, when near, threw out a long thread, on which were several globules of a transparent fluid. This partially succeeded, for the *Mimetus* was caught by one leg; and while the *Theridion* retreated for observation, it was confined, and dragged about for a long time, before it succeeded in freeing itself. The battle presently was renewed, and this time the *Theridion* was conquered, and eaten. *Habitat.* Alabama.

2. MIMETUS TUBEROSUS.

Plate IV. Fig. 14.

Description. Pale or livid green; cephalothorax with a black mark branching out towards the eyes; abdomen subconical, with a tubercle near each of the anterior angles on the side; disk brownish, obscure, with pale spots and a serrated black line; feet hairy, with many black rings; first and second pair long, with the penult joint bent in the female, nearly straight and shorter in the male.

Observations. This is sufficiently distinct from M. *interfector*, in the form of its abdomen, and the comparative brevity of its feet, particularly in the male. A female was found changing her skin on the ground. Many have been seen, but none were observed to make any web.

Habitat. Alabama. August — October.

3. MIMETUS SYLLEPSICUS.

Plate IV. Fig. 15.

Description. Pale green; cephalothorax varied with black; abdomen with a waved line and disk black; feet and palpi very hairy; thighs of first and second pair of legs with a black ring near the tip.

Observations. This spider was found safely hidden in the tent of an *Epeira labyrinthea*, which it had no doubt first killed. The webs and the cocoon of its victim were uninjured, and it seemed perfectly at home in its new domicil. How long it would have continued to dwell there, and to avail itself of the industry of its predecessor, I cannot tell, as I took it to describe as a new species of *Epeira*.

Habitat. North Carolina.

Subgenus Thalamia. Mihi.

Characters. *Eyes eight, subequal, in two rows on each side of the front part of the cephalothorax, each row curved inward above, and outward below; maxillæ wider at*

base, inclined over the lip; cheliceres very small; feet 2. 3. 4. 1.

Observations. Araneïdes small, forming a tubular dwelling of silk in the crevices of walls, protected from the sun and rain. This very distinct subgenus has some affinity to *Theridion.*

THALAMIA PARIETALIS.

Plate IV. Fig. 16.

Description. Obscure; cephalothorax pale, with a bifurcated blackish line; abdomen with several dusky small spots; feet slender, 2. 3. 4. 1.

Observation. This very active little spider dwells in crevices of walls, in narrow tubes with an orifice, which serve as nets to arrest its prey. It was discovered and delineated by Charles A. Hentz.

Habitat. South Alabama.

SCYTODES CAMERATUS.

Plate IV. Fig. 17.

Description. Pale testaceous; cephalothorax large, with various curved dusky lines; abdomen varied with dusky dots and lines; feet with dusky rings; 1. 4. 2. 3.

Observations. This spider, which dwells in almost total darkness, in closets among rubbish, does not make any visible web, though it obviously belongs to the genus *Scytodes* of Latreille. It is most commonly found in the folds of old rags or refuse papers, and shows but little activity in its movements, evidently avoiding the light.

Habitat. North Alabama.

Art. III. — *Chemical Examination of some American Minerals.* By J. D. Whitney.

I. FIBROUS HYDRATE OF MAGNESIA, NEMALITE OF NUTTALL, THOMSON AND CONNELL.

The fibrous hydrate of magnesia which was first discovered and named by Nuttall, without analysis, but which was considered by him as hydrate of magnesia, has been twice subjected to analysis with very discordant results. Thomson, having examined a specimen which contained a portion of silica, or silicate of magnesia, mechanically intermixed, gave for this mineral the formula

$$\dot{\mathrm{Mg}}\ \dddot{\mathrm{Si}} + 2\ \dot{\mathrm{Mg}}\ \dot{\mathrm{H}};$$

his analysis having given him about twelve per cent. of silica. Connell has more recently analyzed the same mineral, and, happening to have a specimen which contained no silica, but a considerable quantity of carbonate of magnesia, also mechanically intermixed, he gives as the result of his analysis the formula

$$5\ \dot{\mathrm{Mg}}\ \dot{\mathrm{H}} + \dot{\mathrm{Mg}}\ \ddot{\mathrm{C}}\ \mathrm{H};$$

a highly improbable one.

I have examined a specimen of this mineral from the cabinet of F. Alger, Esq., and find, that when perfectly pure, it contains neither silica nor carbonic acid, but that it is a fibrous hydrate of magnesia, though it often occurs mixed with the silicate and carbonate of magnesia. If a few fine fibres of the mineral be placed in dilute acid, the effervescence will be found to be but momentary, and confined to the extremities of the fibres, where they were in contact with the gangue; as soon as the adhering impurities have been removed the mineral dissolves without effervescence.

The following results of an analysis will show conclusively that the nemalite is essentially hydrate of magnesia, or

Brucite, from which it does not differ otherwise than by being in a fibrous state.

Magnesia	62.89
Protoxide of iron	4.65
Carbonic acid	4.10
Water (by loss)	28.36
	100.00

A small portion of magnesia is replaced by protoxide of iron. The formula of Brucite, $\dot{Mg}\,\dot{H}$, requires,

Magnesia	69.67
Water	30.33
	100.00

II. CHEMICAL EXAMINATION OF A MINERAL CONTAINING OXIDE OF URANIUM, FROM THE NORTH SHORE OF LAKE SUPERIOR.

The specimen of which the analysis follows, was given me by J. W. Foster, Esq., and is the same mineral which has been named *Coracite* by Mr. J. L. Le Conte, and partially described by him in the Am. Journal of Science (New series, Vol. III. p. 174.) As it is evident that the conclusions drawn by Mr. Le Conte from his qualitative examination, were quite incorrect, and as the mineral differs considerably, in its reaction with acids, from pitchblende, with which it has the greatest analogy, and which at first sight it would seem to be, I have carefully examined it, with the following results.

Substance amorphous; fracture uneven; without traces of cleavage; H. 3.; S. G. —; color pitch-black; powder grey; lustre resinous.

Before the blowpipe it does not change its appearance, or fuse, or color the flame. It gives with the fluxes the characteristic reactions of uranium.

It dissolves readily without the application of heat in dilute chlorohydric acid, effervescing strongly; in which respect it differs entirely from pitchblende, which is insoluble, except

in nitric acid or in aqua-regia. It gives a beautiful green solution, a small quantity of flocky silica separating.

The analysis was conducted as follows:

A portion of the mineral, carefully selected and freed from foreign matters, was pulverized and dried at 100° C. It was then dissolved by chlorohydric acid in a suitable apparatus, the loss of weight being considered as carbonic acid. The silica separated by filtration was found to be pure when tested by the blowpipe, and was entirely soluble in carbonate of soda. In the solution filtered from the silica, sulphuretted hydrogen threw down a precipitate, at first dark brown and afterwards black, of sulphuret of lead, which was estimated as sulphate of lead by oxidizing with nitric acid. The filtered solution was then digested till it no longer smelt of sulphuretted hydrogen, and oxides of uranium and iron and alumina precipitated by caustic ammonia. The precipitate was washed with water to which chloride of ammonium had been added, and then taken moist from the filter, and re-dissolved in chlorohydric acid. In this solution oxide of iron and alumina were precipitated by carbonate of ammonia, the oxide of uranium remaining in solution, and care being taken that the solution should be quite dilute, in order that the iron might be entirely precipitated. The oxide of iron and alumina were separated by caustic potash. In the solution filtered from these substances, the uranium was precipitated by adding chlorohydric acid to supersaturation, boiling, to expel all the carbonic acid, and then adding ammonia.

In the solution from which the precipitate by ammonia, of uranium, iron and alumina had been separated, the lime was thrown down by ammonia and oxalic acid. The filtered solution was evaporated to dryness, and the ammoniacal salts driven off by ignition, when there remained traces of magnesia and manganese.

The water was estimated by ignition in a bulb-tube, and collecting the water driven off in a weighed chloride of calcium tube. The mineral does not, however, part with any of

its carbonic acid at a temperature below that required to drive off all the water, nor is it rendered less soluble by exposure to the strongest heat of a Berzelius lamp.

No traces of sulphur could be found by boiling the mineral with fuming nitric acid, and testing with chloride of barium. The lead has therefore been calculated as oxide, and not as a sulphuret.

The per centage results of two analyses are as follows:

	I.	II.
Silica	4.35	5.60
Alumina	.90	3.64 (Alumina and Oxide of iron bracketed)
Oxide of iron	2.24	
Oxide of uranium	59.30	57.54
Oxide of lead	5.36	5.84
Lime	14.44	13.47
Carbonic acid	7.47	
Water	4.64	
Magnesia and manganese	traces	
	98.70	

That the uranium exists in the mineral as $\dddot{\text{Ʉ}}$, and not as $\dot{U}\,\dddot{\text{Ʉ}}$, as in the common pitchblende, is evident from its ready solubility in acids; and that the oxide of uranium, or uranic acid as it might with equal propriety be called, is in chemical combination in the mineral is equally evident, from the fact that its solubility is not diminished by ignition. That the silica is also chemically combined is shown by the fact that it is separated in a state in which it is soluble in carbonate of soda. It is difficult to see in exactly what manner these elements are combined with regard to each other, though it is probable that the oxide of uranium plays the part of an acid toward a portion of the lime, (the remaining portion being in combination with the carbonic acid) and the lead. The frequent occurrence of a small quantity of oxide of lead with the ores of uranium, is an interesting fact, on which future investigations may perhaps throw some light.

III. ANALYSES OF PECTOLITE AND STELLITE, AND PROPOSED UNION OF THESE TWO SPECIES.

Pectolite occurs on Isle Royale, Lake Superior, in spheroidal masses, consisting of delicate silky fibres radiating from a centre, which exactly resemble the foreign specimens of this mineral from Monte Baldo. The radiated, stellated mineral from Bergen Hill, N. J., which was analyzed by Beck, and supposed by him to be identical with the stellite of Thomson, agrees also in external characters with the pectolite. Specimens from Isle Royale and from Bergen Hill fuse, like pectolite, readily, with but little intumescence, to a blebby colorless glass. They are easily dissolved by chlorohydric acid, the silica separating as a flocky powder.

The following are the results of the analysis of specimens of the pectolite and stellite.

	I.	II.	III.	IV.
Silica	53.45	55.66	54.00	55.00
Lime	31.21	32.86	32.10	32.53
Soda	7.37	7.31	8.89	9.72
Potash	trace		trace	
Alumina	4.94	1.45	Ṁn 1.90	Mn 1.10
Water	2.72	2.72	2.96	2.75
	99.69	100.00	99.85 J. S. K.	101.10 G. J. D.

I. and II. are specimens from Isle Royale. No. I. contains a considerable portion of alumina, which is evidently not essential to the composition of the mineral, since II., resembling it entirely in external appearance, gives only one and a half per cent. The silica in both these analyses contained a small quantity of substance insoluble in carbonate of soda, evidently quartz mechanically intermixed with the finely fibrous mineral.

III. is the mineral from Bergen Hill, N. J., analyzed by Beck, He has erroneously given 6.8 per cent. of magnesia in this

mineral. Otherwise, substituting soda for magnesia, his analysis agrees pretty nearly with the one given above, which was done under my direction by Mr. J. S. Kendall. Hayes had also analyzed this mineral, and corrected Beck's analysis as far as relates to the absence of magnesia, and the presence of soda. He however did not find that it contained water, which is essential to the composition of pectolite.

IV. is also a fibrous mineral from Bergen Hill, which evidently agrees in composition with pectolite. It differs from the other specimen from the same locality, in its fibres being straight and not grouped together into star-like forms. This analysis was executed at my request by Mr. G. J. Dickinson.

It is evident that these minerals all agree in chemical composition with the pectolite of Von Kobell, and also in external characters. Slight differences in the results of the analyses may easily be accounted for by the difficulty of procuring a finely fibrous mineral in a state of known freedom from intermixture with foreign substances.

The formula given by Von Kobell for Pectolite is

$$3\ \dot{Na}\ \dddot{Si} + 4\ \dot{Ca}^3\ \dddot{Si}^2 + 3\ \dot{H}$$

which formula requires

Silica	52.55
Lime	34.94
Soda	9.70
Water	2.79
	99.98

Frankenheim considers the water in the pectolite as unessential, and allies this mineral with the Augite family, from which it differs widely in chemical characters. The constant presence of nearly 3 per cent. of water in all the analyses of the substance dried at 100° C., makes it highly improbable that it should be merely accidental. In fact, the formula given above seems to be the only one which could be adopted for this mineral.

The original stellite, described by Thomson as occurring in Scotland, was probably an impure specimen of pectolite, which mineral it agrees with in external characters, as well as in chemical composition, merely substituting soda for magnesia; a liberty which will not be considered as unwarrantable with respect to an analysis by Thomson. The mineral described by the same chemist under the name of Wollastonite, under the erroneous impression that that name had not been generally adopted for table-spar, is also evidently identical with pectolite.

Art. IV. — *Examination of three new Mineralogical species proposed by Prof. C. U. Shepard.* By J. D. Whitney.

In Silliman's Journal, Vol. II. (new series) page 249, Prof. C. U. Shepard has described and named three new species of minerals, as he considers them, Arkansite, Ozarkite, and Schorlomite. They are all from the same locality, in Arkansas. As, according to Prof. Shepard's conclusions, these minerals were of the most interesting character, containing substances alike rare and difficult of detection, it seemed desirable that they should be more accurately examined, that, if their chemical composition was such as stated by Prof. Shepard, some idea might be obtained of their quantitative composition, and the proper formulas by which it might be expressed, or, if not, that their real nature might be made known.

I have, through the kindness of Messrs. F. Markoe and F. Alger, obtained specimens of each of these three minerals, the results of the examination of which I will proceed to detail, in the order in which they are described by Prof. Shepard.

I. ARKANSITE.

This mineral is crystallized in right rhombic prisms. The specimens which I have are none of them sufficiently brilliant

to permit the use of the reflecting goniometer. M on M is given by Prof. Shepard as 101°. The specimens which I have are nearly of the form figured by him in his "farther account of the Arkansite." (Silliman's Journal, Vol. IV. new series, p. 229.) Like the crystals described by him, they are implanted on quartz crystals, and about one fifth of an inch in diameter. Hardness 6; Specific gravity 4.085; the other external characters are nearly as given by Prof. Shepard.

The chemical composition of the Arkansite seems to have been a matter of some doubt with the Professor, for, from his first examination, he concludes the mineral to be a titanate of yttria, and possibly zirconia and thorina; on a second and more deliberate investigation, he decides that it is a "niobate of yttria and thorina." I need hardly say that the detail of the investigations does not justify either of these conclusions.

On examining the Arkansite before the blow-pipe, titanic acid was readily detected in it, it being found to have exactly the reactions of this substance as it occurs in nature in the form of rutile, Brookite or anatase. The specific gravity of the mineral is given by Prof. S. as 3.854; this seemed to me hardly probable, as, were the mineral essentially titanic acid, as I at once supposed it to be, having the crystalline form of Brookite, (M on M, as given by Prof. S. on crystals too dull to allow of accurate measurement, only differing 1° from Brookite,) it could not be expected to have a specific gravity as low as that of anatase. I therefore carefully determined it on about three grammes of the small crystals, and found it to be 4.085, which is very near that of Brookite, a very little less, some of the crystals probably being slightly intermixed with the quartz, from which it was difficult to free them entirely. This agreement in the specific gravity was a confirmation of my views with regard to the composition of the mineral; I therefore examined it qualitatively, and have fully satisfied myself that the Arkansite is titanic acid, with a trace of iron, having the crystalline form and specific gravity of Brookite. Its insolubility in acids is already strong presump-

tive proof that it is not titanic acid in combination with a base, since all the known titanates are soluble in acids. How Prof. Shepard was led to suppose the mineral to be a niobate of yttria and thorina, I am unable to explain. Its specific gravity alone is sufficient proof that such could not be its composition.

This is then a new form of Brookite, and as such, interesting, especially as it has the color and opacity of nigrine, (variety of rutile) with the crystalline form and specific gravity of the former mineral.

II. OZARKITE.

This mineral from the same locality as the former, Magnet Cove, Hot Springs Co., Arkansas, is not a crystallized substance, but forms a thin coating on elæolite, or small ovoidal masses in it; it being, as described by Prof. Shepard; constantly separated from this mineral by a thin layer of a reddish substance.

It seems hardly worth the while to contend the claim to rank as a new species of a substance of which no analysis is given, which merely forms a thin amorphous incrustation on another, and the purity of which we have no means of ascertaining; it would be sufficient to say that no substance, unless evidently crystallized in a new form, can be allowed to be new till it has been proved to be such by accurate analysis. Prof. Shepard says, without giving any reasons, that it appears to be "a silicious hydrate of lime and yttria, possibly also having traces of thorina."

On separating a portion of this mineral as pure as possible, and testing it before the blow-pipe, I find that it fuses with great facility, intumescing slightly, like a zeolite, and having a tendency to swell up with vermicular contortions like mesotype or scolezite. It colors the flame yellow, indicating the presence of soda, and emits a brilliant light like a silicate of lime.

It is readily dissolved by acids to a clear liquid, a reac-

tion highly characteristic of a certain class of silicates of alumina and soda or lime, of which scolezite and elæolite are examples. A qualitative examination showed it to be a hydrous silicate of alumina and lime, with a little soda; in short, it has in every respect the character of a lime-mesotype, or scolezite, which mineral sometimes occurs massive; and as the amount of water it contains, as determined by Prof. Shepard, agrees pretty nearly with that in scolezite, I feel little hesitation in classing it with that mineral; at any rate, we may be safe in pronouncing it to be such, till it has been proved by an accurate analysis, giving a new and probable formula, to be something new.

It contains neither yttria nor thorina.

III. SCHORLOMITE.

This mineral is described by Prof. Shepard as occurring in hexagonal prisms with lateral edges truncated by narrow and brilliant planes. In the specimens which I have had an opportunity of examining there are two distinct minerals. One is crystallized in rhombic dodecahedra, of which the faces are small and distorted, except in one specimen, in which they are quite distinct.

This mineral has the lustre, color, hardness and other characters of colophonite. It is of a deep clove-brown color, almost black, translucent on the edges. A qualitative examination showed it to be composed of silica, oxide of iron and lime; it is undoubtedly a lime-iron garnet or colophonite.

Associated with this colophonite is another mineral, which is amorphous. Its hardness is 7.5; specific gravity 3.807; color black; entirely opaque; lustre vitreous; tarnished with pavonine tints; fracture highly conchoidal.

This mineral I have, with the assistance of Mr. R. Crossley, carefully analyzed, and find it to be new, though it differs so much in external characters and in chemical composition from the mineral described by Prof. Shepard as schorlomite, that I have not considered myself justified in appropriating

that name, which may be dropped till the real "hydrous silicate of yttria, thorina and oxide of iron" to which that name was given, shall be found. This mineral, to which I shall give the name of *Ferrotitanite*, is an anhydrous silicate and titanate of lime and oxide of iron.

The ferrotitanite fuses readily before the blow-pipe without intumescence, and gives a black glass. It gives with the fluxes, beads colored with iron, and with soda, a trace of manganese. The salt of phosphorus bead, gives in the reducing flame the characteristic color of titanium, which appears still more distinctly by the addition of tin.

The mineral is readily dissolved by chlorohydric acid, if finely pulverized, the silica separating as a flocky powder; though, as H. Rose has remarked, under whatever circumstances the solution be effected in the analysis of a titaniferous silicate, the silica separated always contains titanic acid.

The following are the results of the analyses:

	I.	II.	III.
Silica	27.89*	25.66	25.14
Oxide of iron and a little manganese	21.90	21.58	
Lime	30.05	29.78	
Titanic acid	20.43	22.10	
	100.27	99.12	

In I. and II. the mineral was attacked by chlorohydric acid. The amount of silica in I. obtained by filtration was 27.89 per cent. This silica contained titanic acid and a trace of lime, which was not however separated. In II. the silica separated after solution was 28.00 per cent.; it was treated with concentrated sulphuric acid till no more was dissolved, and 2.34 per cent. of titanic acid was found in it. The remaining substance, after being washed, ignited and weighed, had all the properties of pure silica. To test the accuracy of the determination of the silica another portion of the mineral was

* Contained titanic acid which was not separated.

attacked with sulphuric acid. The solution was effected very slowly, and chlorohydric acid was added, which was afterwards expelled by evaporating the solution. The removal of the sulphate of lime which remained undissolved when the solution was diluted with a large quantity of water, required long washing. The results show, however, that the attack was perfect, and the silica obtained was perfectly pure.

The difficulty of attacking this mineral completely, by sulphuric acid alone, seems much greater than that experienced by Rose in his analyses of sphene, since he recommends this method of attack as preferable to any other, in case all the ingredients of the mineral are to be determined. The tedious operation of repeatedly heating with sulphuric acid, and the long continued washing necessary to remove the whole of the sulphate of lime, render this a very undesirable method in any case, and in the analysis of the ferrotitanite it would have been impossible to effect a complete decomposition of the substance, had not chlorohydric acid been added ; since, after the substance had been several times heated with concentrated sulphuric acid alone, the solution being each time largely diluted with water, and allowed to settle before being poured off, a very considerable portion of the mineral remained unattacked. Analysis I. shows that when the attack is made by means of strong chlorohydric acid, even when the solution was heated nearly to the boiling-point for some hours, the quantity of titanic acid remaining in combination with the silica was not by any means so large as to lead to very incorrect conclusions as is the case with the silica obtained from an analysis of sphene by the same method. By a careful digestion of this mineral, at a low temperature, with chlorohydric acid, Rose obtained 51. per cent. of residue, instead of 30.9 per cent. required by the formula.

The method of attack by bisulphate of potash might be adopted with advantage, were it not that the silica enters into an insoluble combination with a portion of the sulphate of potash, so that in an analysis executed in this way, the quantity of silica obtained is always considerably too large.

The use of fluohydric acid in the analysis of titaniferous silicates, is attended with only one disadvantage, namely, that it does not allow of the direct determination of the silica; in other respects it would have decided advantages over any other method.

The ratio of the oxygen of $\dddot{\text{Fe}} : \dot{\text{Ca}} : \ddot{\text{Ti}} : \dddot{\text{Si}}$, being 6.47 : 8.52 : 8.81 : 13.33, which may be taken at 3 : 4 : 4 : 6, the formula will be

$$(\dot{\text{Ca}}^3 \, \dddot{\text{Si}} + \dddot{\text{Fe}} \, \dddot{\text{Si}}) + \dot{\text{Ca}} \, \ddot{\text{Ti}}^2.$$

This formula requires

Silica	25.30
Oxide of iron	21.92
Lime	30.80
Titanic acid	21.96
	99.98

It will be seen that the two first terms of the formula are the formula of the lime-iron garnet, which occurs associated with the ferrotitanite, the latter being a combination of one atom of garnet with one atom of bititanate of lime. Its analogy with sphene, or titanite, will at once be recognized, and hence the name ferrotitanite, to indicate a mineral allied to titanite, and containing, in addition, oxide of iron.

Rose, from his researches on the titanite, gave for this mineral the formula

$$\dot{\text{Ca}}^3 \, \dddot{\text{Si}} + \ddot{\text{Ti}}^3 \, \dddot{\text{Si}},$$

which Berzelius modified thus,

$$2 \, \dot{\text{Ca}} \, \dddot{\text{Si}} + \dot{\text{Ca}} \, \ddot{\text{Ti}}^3,$$

on the ground that the lime would be a so much stronger base than the titanic acid, if this latter should be considered a base, that a basic salt of the lime would necessarily appropriate a sufficient quantity of the silica to become saturated, and, if a portion remained over, it would combine with the titanic acid. This view of the case seems confirmed by the results of the analysis of the ferrotitanite.

Art. V. — *Observations on some of the habits of Salmo Fontinalis.* By Samuel L. Bigelow, M. D.

The following observations on the habits and peculiarities of a species of Salmo, were made in a comparatively short space of time, without any reference to science, but merely as a source of pleasure to myself, and to gratify a natural curiosity.

The pond in which these trout are found, is situated at the base of the north-east ridge of the Monadnock mountain. It covers an area I should think, of seventy-five or one hundred acres, and is so deep about the centre, that soundings have not been found, though a line has been sunk two hundred feet. It is supplied entirely by springs at the bottom, which is composed of red and white sand and rocks, so far as the depth of the water will permit of an examination. The water is always very cold, and so clear that the bottom may be seen, in a bright day, to the depth of twenty-five or thirty feet; and although there are neither inlets nor outlets, its height is nearly the same at all seasons. Its depth increases from the shore, where it is only a few inches, in some parts gradually, and in others rather abruptly. The form of the pond is quite irregular, and has been fancied by some to correspond very exactly to that of the base of the mountain, which is close beside it. From this circumstance, together with its great central depth, has arisen a legend of its having been once filled by this mass, now a mountain, which was heaved out by some convulsion of nature.

The south-west shore is more stony, and less exposed than almost any other, and here it is that the trout form their beds and come up to spawn. Another natural advantage which this point possesses over others is, that here the change from shallow to deep water is quite abrupt, affording the trout a better chance for escape in case of fright or danger.

Their beds, as they are called, are merely small cavities formed by the accidental position of three or four stones, sunk to their upper surfaces in sand. Their capacity is generally from a pint to a quart, and their forms are various; sometimes conical, with the base upward, sometimes flat and shallow. They are most numerous within ten feet of the shore, and in not more than ten or twelve inches of water. The trout having selected these little cavities, clean them out with great care, removing the finer particles of dirt by fanning with their tails, and the larger with their mouths; this done, they have a bed which they visit for a successive series of years, which will be longer or shorter, as they are more or less disturbed. An old fisherman pointed out to me abandoned beds, on which he had in former years taken great numbers. They were on the south side of the pond, whence the fish had gradually followed the shore, till year before last, when they came up on the extreme south-west shore, where I found them. They remain in the deep water about the centre of the pond, during the entire year except the spawning season, which commences about the first of October. So precise are they in their time of appearing, that this fisherman has for the last six or eight successive years taken fifty or seventy-five pounds, on the first day of October, when even the day before he could neither see a trout nor get a bite. They failed, however to be thus regular last season. The first four days of October were quite warm and rainy, and with almost constant fishing we caught only ten or fifteen pounds during that time, and those in water of twenty or twenty-five feet in depth. This proximity to the shore, however, showed them to be approaching their beds, and a few cold nights brought them up. The unusual mildness of the season, causing too great a difference in the temperature between the deep water they inhabit and the shallows on the border, may be the cause of their late appearance. But it was no easy matter to make a convert of the old fisherman to this doctrine; he held firmly to his old notion, that "they had a wonderful sight of alman-

ack learning," — they had only "missed their reckoning." Having reached their beds they lose almost entirely their natural cautiousness and shyness, and seem wholly absorbed in the object of their visit, endeavoring in turn, to reach a bed, which they remain upon till their ova are deposited. If frightened by a sudden or violent motion of one standing on the shore, over them as it were,. they reluctantly retire a little distance, but almost immediately return. The males follow the females closely at this time. They are, I should think about in the proportion of one male to four or five females. I was in the habit of disturbing them daily, from sunrise till dark ; and prevented them to a great extent from remaining quiet long enough to spawn ; so they were compelled to come up in the night, in order to go through with their labor undisturbed. In the females which I took the day before they began to spawn at night, I found the membranes enclosing the mass of ova, ruptured, and a continuous line of single ova extending from the mass, through the passage, and stopping directly within the external organs, which were very red and much swollen. The spawning season lasts, I think, for two or three weeks ; after which they retire again to the deep water, where they can be taken only in the winter, through the ice. Generally in spawning-time there is no difficulty in taking them with a baited hook ; but last season, perhaps owing to their being late, and pressed to the performance of their functions, they passed all kinds of bait and hook untouched. In the winter, the only bait used is the minnow ; but in October it is various, as the grasshopper, angle-worm, and artificial fly. These are most used ; but I found that when they passed all these, they would often take readily their own spawn, dried a little in the sun. Another means of taking them at this time, is by a slip-noose of strong wire attached to the end of a short pole. This is passed over the tail or head, it matters little which, they are so careless at this time, and carried to the centre of the body ; when a strong and sudden pull will bring them to the shore. Another mode of

catching them is by means of a large hook attached to a short pole and line. This is carried under the fish, and secured in the body by a sudden jerk, which lands the fish on shore. Four hooks are sometimes used, bound together by the shanks in such a manner that the points are presented at right angles to each other. If these are dropped among a number there is a chance of securing more than one; and if a single fish is the object, his chance of escape is made less. These are both easy methods. At this time they do not seize the bait with the suddenness of the common brook trout; they take it calmly and retire deliberately, like the perch. They vary in size from one quarter of a pound to five pounds; but those taken are seldom less than one quarter or more than three pounds. The larger ones are taken almost exclusively in the deep water, through the ice. The males are of a very brilliant and shining dark brown or olive color on the back. The sides are brilliant and silvery, and are traversed by a longitudinal line, and covered with very bright red and yellow spots. The belly is perfectly white. There are some spots on the fins, but I cannot say on which, nor if all are spotted; nor do I know the precise number of spots. The females are less brilliant than the males; the back is lighter and more dingy, the sides are less silvery, and the spots are fewer and less bright. Several females which I took were of a yellow brown color, darker on the back than on the sides, with a yellowish white belly. They were mottled and looked as if water-soaked. These trout, as a whole, were much more silvery and brilliant, and had more and brighter spots than most brook trout. Their flesh is red, but not so dark as that of the salmon. There is but one other kind of fish found in this pond, viz., the perch. They live in an entirely distinct part from that occupied by the trout, and I think they are never seen or taken together. The perch are only about the north-east shore, which is quite rocky. The trout have been taken in this pond, as far as I could learn, from time immemorial, and formerly in so great numbers, to use the language of the old fisherman, as to

"have been fed by bushels to the hogs."[1] This is by no means the case at the present day.

Art. VI. — *Description of a New Genus of Fishes, Malacosteus.* By W. O. Ayres, Boston Mass.

The specimen from which the following description is drawn, was picked up at sea, in N. Lat. 42° and W. Long. 50°, by Capt. Joseph R. Porter, of St. Stephens, N. B., in a voyage from Liverpool to Boston, during the month of June, 1848. It was alive when taken, and was floating in a vertical position, with the snout a little above the surface of the water. It is in excellent preservation, and is now in the possession of Miss L. Felt, of Boston. To her kindness I am indebted for the opportunity of describing it, and making known a species which is certainly one of the most remarkable ever found near our coast.

It differs so widely from every established genus, that even its place in the system becomes a matter of question. It is, therefore, necessary to form for its reception, a new genus, for which I propose the name *Malacosteus,* and which may be thus characterized.

Mouth extremely deep-cleft; border of the upper jaw formed principally by the maxillary, the intermaxillary being short. Teeth in the upper jaw small, separate, and sharp-pointed, on both maxillary and intermaxillary. Teeth in the lower jaw very long, separate, somewhat hooked, followed by others much smaller and closer together. No teeth on the palatines, vomer, or branchial arches. A double row on the tongue; a cluster on each superior pharyngeal, similar to those on the tongue. A single dorsal fin near the tail, opposite the anal. Whole fish entirely destitute of scales. All of the bones remarkably soft. Opercular pieces consisting of a

membrane without ossification. Branchial rays not discernible.

The species, from its color, may receive the name of

MALACOSTEUS NIGER.

The description which follows is necessarily in some respects imperfect. The specimen is unique, and as such ought not to be destroyed. And though we are allowed by Miss Felt, with much liberality, to make partial dissections, yet nothing short of removing all the soft parts so as to form a complete skeleton, would serve for entire elucidation. The bones of the head, in particular, are so remarkably different from those of any other fish known, that it is difficult to settle their relations, and it is very probable that in our conjectures as to their analogy we may err widely from the truth. A generic name, drawn from some of their peculiarities, would perhaps, be more characteristic than the one already proposed, (which has reference to the singular structure of all the bones,) but the uncertainty in regard to them forbids it.

Body elongated, nearly cylindrical, somewhat compressed. In its present state the compression is rendered more decided by the alcohol in which it has been kept. Entire length, eight and one-half inches. Depth greatest at the head, where it is one inch and three-tenths; immediately before the dorsal and anal fins it is three-fourths of an inch. The muzzle is very short and obtuse.

The nostrils are not discernible without close examination. They are situated immediately in front of the eyes, at the anterior extremity of the head. The nasal cavity is oval, about one-twentieth of an inch in length. The apertures are scarcely visible.

The eyes, which are large, are very far forward. They are but about one-tenth of an inch from the blunt muzzle, and are four-tenths of an inch in length, nearly circular.

The opening of the gills is uncommonly large, and is, in fact, one of the striking characteristics of the species. It extends from the posterior angle of the lower jaw, obliquely

upward and forward, one inch and eight-tenths, reaching within about one-tenth of an inch of the nape of the neck, and within six-tenths of an inch of the anterior extremity of the head, so that the bones of the cranium are, of course, reduced within this length of about half an inch.

The gape of the mouth is monstrous, the distance from the tip of the lower jaw to its articulation being two inches and one-tenth. The lower jaw, which is slender and nearly straight, is provided with very large, sharp teeth, slightly curved backward, separate and distinct, five or six on each side. The largest of these are three-tenths of an inch in height. These larger teeth occupy the anterior half of the jaw, while intermingled with them, and also posterior to them are other similar teeth, but much smaller. In the upper jaw we find no large teeth, like those of the lower. There is a single row extending about half the length of the jaw, small, sharp, separate, and slightly curved backward, three or four of the anterior ones being rather larger than the others; exterior to this row we find traces of another. There are no teeth on the palatines, the vomer, or the branchial arches. The tongue has two rows; they are sharp, curved backward, and somewhat larger than those of the upper jaw. The superior pharyngeals have also teeth which are similar in size to those of the tongue. These pharyngeal clusters are oval, about three-eighths of an inch in length, and contain each from twelve to fifteen teeth.

On the cheek, immediately above the maxillary bone, and about half an inch behind the eye, is a feature which is quite singular. It is an ovoid body, one-sixth of an inch in length, of a dead white, entirely similar to the lens of the eye as changed by the alcohol. What was its appearance during life we do not know. It is, from the contraction caused by the alcohol, brought more into view than would probably be the case in its natural state. The similarity of the whole to an eye is very striking. As to the nature or the use of this peculiar organ, analogy could afford us but little instruction, for there

is nothing in any other species known, with which we may compare it. We have, it is true, an indication of something like it on the figure of *Stomias boa*, given by Valenciennes, but as no mention is made of it in the description, I am led to believe that the light spot is simply an accidental occurrence in the engraving. We are, however, not left to analogy, the microscope decides the point at once. This anomalous body is composed of muscular fibres! For this strange discovery I am indebted to Prof. Agassiz. With a power of four hundred, the fibrous structure is too plain to be mistaken, though when magnified only two hundred diameters this structure is not visible. I am also assured by him that no such body exists on the cheek of *Stomias*. But though we are thus made certain of the nature of this organ, we are nearly as far as ever from a full understanding of its relations and uses. On many fishes, particularly of the *Salmonidæ*, a portion of the masseter muscle forms a rounded, fleshy mass, which can be detached from the remaining body of the muscle with considerable facility. Perhaps the organ on the cheek of *Malacosteus* represents this fleshy mass. But if so, why are its fibres so extremely minute? Why does it assume this perfectly separate, ovoid form and isolated position? And above all, why does it undergo a change which muscular fibre nowhere else undergoes, becoming by the action of alcohol, like the crystalline lens?

We can but leave the matter in this state of uncertainty, and trust that the discovery of other specimens may enable observers to decide the point.

The whole fish is covered with a smooth skin, entirely destitute of scales, or of any traces of their development.

The color in all parts is black.

The *pectorals* are situated beneath the body, one inch and five-tenths from the tip of the lower jaw. They consist of five rays, so united as to seem, except under a magnifier, like a single filament. The external ray is very short, the second is about three-eighths of an inch in height. The third and

fourth, which are the longest, are about an inch and a half, but their tips are slightly broken, and it is not possible to tell which of the two was the longer. The bases of the pectorals are half an inch from each other.

The *ventrals*, which are of the same height as the pectorals, and nearly as slender, are situated a very little posterior to a point equidistant from the muzzle and the tip of the caudal. They consist of six rays, of which the outermost is the shortest, being only a quarter of an inch in length. The second, third, and fourth are the longest, and for more than half their length are free.

The *dorsal* and *anal* are situated at the posterior extremity of the body, opposite to each other. The origin of the dorsal is a very little in advance of that of the anal, and its termination as much so. Their form is entirely similar. The first rays are short, and are succeeded by others increasing in length; at the middle they attain the same height in each fin, (six-tenths of an inch,) and then decrease more abruptly to the termination. The rays are somewhat mutilated, but the numbers appear to have been nineteen in the dorsal, and twenty in the anal. Behind these fins the body is contracted very abruptly, till its vertical diameter is only one-tenth of an inch. The length of this slender portion, which extends to the caudal fin, is four-tenths of an inch.

The *caudal* is so much mutilated that its form cannot well be ascertained. It appears to have been rounded, and to have consisted of about twelve rays, which were more branched than those of the other fins.

The *skeleton* of this fish is most remarkable, and though, unfortunately, we have it not in our power to make a thorough investigation, yet such results as we can obtain will be given. One of its most striking peculiarities is, that the entire osseous system is in a very low state of development. All of the bones are quite soft. From this fact the generic name is derived. Through the vertebræ even a needle can be passed without difficulty, the resistance being about the same as in

piercing cartilage, while many of the bones are entirely wanting, or their places merely indicated. We commence with the bones of the head.

The *principal frontals* present no trace of ossification, unless it may be a minute space, near the middle portion of their external border, over the orbit of the eye. Through any part of the upper surface of the head, with a small exception, which will presently be mentioned, a needle passes as readily as through the skin on any other part of the fish. Along the middle of this upper surface runs a slight longitudinal ridge, extending almost to the posterior border of the head; it is probably scarcely visible during life. This line, I suppose, indicates the division of the frontals. From its extremity four similar lines diverge, two passing outward and backward, and two others outward and forward, to the middle of the orbit of the eye. At the point from which these lines diverge, is the exception which has been already noted. A small space there, irregularly circular in form, about a tenth of an inch in diameter, is somewhat ossified, though still imperfectly. What this little space of bone represents, it is not easy to determine. From its position it might be the *interparietal*, but the raised lines appear to denote divisions of the bones of the head, and as five of these lines meet at this point, it is not impossible that we may have here parts of the *frontals*, the *parietals*, and the *occipital.* Posterior to the line which extends to the middle of the orbit of the eye, we may have the *parietals*, the *posterior frontal*, and the *mastoidean.* The last two are somewhat hardened, the *mastoidean* appearing, in fact, more completely ossified than any other bone of the skull.

From this notice of the upper surface of the head, we turn to what is a little less obscure. The *upper jaw* seems at first view to be formed of a single straight and slender bone, but this is not the case. On closer examination we find both maxillary and intermaxillary. The pedicel of the intermaxillary may exist, but if so it is entirely concealed. The body

of the bone extends about half an inch, overlapping the maxillary, outside of which it terminates by a thin edge. On this bone are the two or three larger anterior teeth of the upper jaw. The two bones are so united as to allow of very little separate motion. The *maxillary* begins by a thin edge, inside the intermaxillary, near the anterior extremity of the mouth, and passes backward the whole length of the jaw. The principal row of teeth, and the partial row exterior to them are on this bone. On its posterior superior angle, we find the little supplementary bone which exists in so many fishes; it is more than half an inch in length. The maxillary reaches within about a tenth of an inch of the angle of the lower jaw.

The *lower jaw* is straight, thin, and narrow. The angle formed by the two branches at their symphysis is very acute. In the structure of the jaw we meet with nothing worthy of note; but its articulation is most singular. The movable cheek of the fish, which covers the gills and makes the side of the mouth, is in form a very acute-angled triangle, nearly isosceles. One of the sides of this triangle is the upper jaw; the base is a line stretching from the front of the mouth obliquely upward and backward, across the eye to the upper angle of the gill-opening; the third side is formed by a slender, nearly straight, apparently single bone, reaching from the upper angle of the gill-opening downward and backward to the apex of the triangle, where it affords attachment for the lower jaw. This appears like a perfect anomaly, that a single bone should form the connection between the lower jaw and the cranium. The anomalous structure, however, is in part explained by removing the integuments. The bone, though single, shows traces of divisions, in such manner as to convince us that three distinct bones are united in its formation. One commencing at the articulation of the lower jaw, passes upward, along the posterior border, becoming narrower as it ascends. This is the *jugal.* It terminates about half an inch below the cranium. In front of it is another, which must be

the *tympanal.* It commences by a thin edge near the inferior extremity of the jugal, grows broader, and again diminishes in such a manner as to leave between it and the jugal a small space at their superior portion. Into this space is inserted the wedge-formed extremity of another bone, which is without doubt the *temporal.* This passes upward and forward, and is apparently articulated upon the mastoid. A better idea, however, of the position and form of these bones may be obtained from an examination of the figure than from description. It may be mentioned that the lines of division are given in the figure with more distinctness than they occur in the specimen. The osseous fibres of one part are so interlaced with those of the one adjoining that it is not easy to tell the precise limits of each bone, though it is believed they are represented with some approach to accuracy.

It will be noticed that a triangular space remains between these bones and the upper jaw. Within this we should of course expect to find the other bones of the cheek, but instead of this, we have no sign of either ossification or apparent outline of the position of a bone. Beneath the eye there is, it is true, a smooth, oval spot, about three-eighths of an inch in length, which seems to indicate a *suborbital,* though without any trace of bony matter, but this is all.

The only part of the head not already mentioned, which is even imperfectly ossified, is the anterior portion of the roof of the mouth, a small space representing probably the *vomer* and perhaps part of the *sphenoid.*

The *opercular* pieces we do not find, unless they are denoted by a membranous projection, which borders posteriorly the slender bone, supposed to be jugal, &c. This membrane commences at the upper extremity of the bone, and extends within about three-fourths of an inch of its lower extremity, where it terminates quite abruptly. Its breadth, which is pretty nearly uniform, was when fresh a little more than a fourth of an inch. It exhibits some tokens of concentric structure. About three-eighths of an inch above its lowest

point is a partial division. The space above this division appears to be the *operculum.* The part below may be the *sub-operculum,* though we have thus no allowance made for the two remaining bones.

The *humeral cincture* seems to exist as in other fishes, but its bones are even less developed than those of the head. In the *humerus* a slight hardening may be observed, and its outline can be well traced on the skin; the others are barely discernible.

The *branchial arches* are not at all ossified, except a mere trace at their upper extremities.

The remaining portions of the skeleton are not within our reach. The vertebræ are very soft, as has already been mentioned, but of their form and number we are ignorant.

On opening the abdomen we find that the *alimentary canal* passes directly backward about three-fourths of an inch, and turns downward, forward, and toward the right side for about the same distance, to a pylorus tolerably well marked. Thus far it is slender, with the walls thick and stout. From the pylorus it becomes thinner, is rather suddenly enlarged, and turning abruptly backward, pursues a straight course to the anus, growing gradually less.

The *liver* consists of two lobes, situated beneath the stomach, on the left side. They are folded upon one another, in such a manner that the point, into which the anterior lobe is prolonged inferiorly, passes back beneath the edge of the posterior lobe, while the left border of the posterior lobe, being produced anteriorly, passes outside of the anterior lobe, and beneath it.

The *ovaries* present a most remarkable feature, one which is, in fact, unique. They are entirely dissimilar. The organ of one side does not match that of the other in form, situation, or size; and instead of designating them as *right* and *left,* we may better call them *superior* and *inferior.* The *superior ovary,* commencing near the stomach, passes backward above

the line of the intestinal canal. In its anterior portion it is about half an inch in width. It tapers gradually for nearly half its length, till it is little more than one-tenth of an inch wide, which breadth it retains, scarcely diminished, almost to its termination. The *inferior ovary* presents anteriorly a broad, rounded lobe. It commences on the left side, near the upper part of the abdomen, above all the other organs except the kidneys. It passes downward and turns inward till it is on the medial line of the abdomen, where it is below all the other organs. It is here about three-fourths of an inch in width. It is contracted very abruptly till it is narrower than the superior at the same point, and tapers then backward like the other. The two ovaries are so united at the point where their narrowing ceases, that the posterior portions seem like divisions of one organ.

The *gall-bladder* is situated on the right side, beneath the ovary, and is about an inch and two-tenths in length, tapering to a point posteriorly. Its communication with the alimentary canal cannot be traced without closer examination than we are allowed to make.

The *kidneys* are very slender, as long as the abdomen.

An *air-bladder* we do not find.

With our present opportunities we can trace the history of this singular fish no further. Of its habits we of course know nothing. It belongs to the deep water, and is of slow motion; all beyond this is mere conjecture. We can but lament that so many points in its structure are left in obscurity, and trust that the discovery of other specimens may enable future observers to make that plain which is now uncertain. Still, enough has been given to show that this species differs widely and most remarkably from every other known. The propriety of establishing a new genus for its reception can scarcely be questioned. Instead of being compelled to compare it with nearly allied genera, and to state the characters in which it differs from them, a much greater difficulty in this case is to

ascertain with what genera it can be compared, or even with what family it may be arranged. The position of the dorsal and anal recalls at once the *Esocidæ*, and it would seem proper to place *Malacosteus* with them. But this is a character of only secondary importance. Prof. Müller has shown that *Belone*, which has these two fins situated as in the genus *Esox*, does not even belong to that family. A feature of much greater value, and which may be deemed the distinguishing characteristic of the *Esocidæ*, is the structure of the upper jaw, which is formed entirely by the intermaxillaries; or, if the maxillaries are present, they are destitute of teeth. With this, it is evident our genus does not agree, and we must look elsewhere for its position and relations. In the *Salmonidæ* we find the upper jaw in general, constructed somewhat as in our fish,—formed of both maxillaries and intermaxillaries, the former being furnished with teeth. And with this family we may perhaps arrange the genus for the present. It exhibits however, many discrepancies, which cause us to doubt the correctness of this decision. It has no cœca, no scales, no natatory bladder, and no adipose fin. But to no other family does it appear to approach so nearly as to the *Salmonidæ*, and here we must leave it. In this I am influenced more by the opinion of Prof. Agassiz than by my own judgment; he would place the genus near *Scopelus*. Wherever placed, it is quite evident that it must take a rank indicated by its embryonic traits.

The principal points on which we may particularly insist as characteristic of the species and the genus are, the remarkably small size of the head, and in contrast with this, the immense development of the whole facial and branchial apparatus, and all that pertains to the mouth and throat; the singular and but partially explained organ on the cheek; and most of all, the embryonic condition of the entire osseous system.

EXPLANATION OF THE FIGURES.

FIG. 1. *Side view.*

FIG. 2. *View from beneath; abdomen opened.*

a. Liver, *c.* Superior ovary,
b. Alimentary canal, *d.* Inferior ovary.

FIG. 3. *Bones of the cheek and jaw.*

a. Jugal, *d.* Maxillary,
b. Tympanal, *e.* Intermaxillary.
c. Temporal,

FIG. 4. *Outline as seen from above.*

The slender body which is seen beneath the throat in Fig. 1, extending in a curve from the symphysis of the lower jaw to the tongue, probably did not exist in that form during life; neither was the tongue separated from the jaw, as shown in the figure. The integuments and parts forming the throat have been lacerated, and their original appearance we cannot now determine.

ART. VII. — *On the* PSELAPHIDÆ *of the United States.* By JOHN L. LE CONTE, M. D.

THE interesting little Coleoptera which are the subjects of the following essay, from the peculiarities of their structure, have received a more than ordinary degree of attention from scientific men. Still it is obvious, from the small size of the species, (none exceeding two lines,) and the rarity of their occurrence, that our knowledge respecting them may yet be very much increased. The slight interest which the science of Entomology has awakened in this country, and the search made after large and conspicuous species, rather than those which from peculiarities of form or habit might be expected to give more information with regard to the true system of organic life, have caused many very curious objects to remain unknown.

It affords me much satisfaction, through the kind liberality of my friends, and the great facilities enjoyed for extensive exploration in distant portions of our country, to remedy in part this defect, at least in the little group herein treated of. Having made them special objects of search for the last two or three years, I have been most abundantly repaid by the discovery of many new forms. As will be seen in the sequel, no less than seven genera are added to those already so well defined in Aubé's beautiful essay, (Annales de la Soc. Ent. de France, 2d ser., tom. 2.) New species have also been discovered of five other genera, not as yet published as inhabiting our continent. So successful has been the limited exploration, that our Pselaphidæ are already nearly as numerous as those in Europe, and embrace a greater number of distinct genera. For the benefit of the American student to whom the memoirs of Aubé may not be readily accessible, I have reproduced descriptions of all his species which remain unknown to me, while those in my possession have been carefully re-described, for the purpose of bringing out more prominently the characters in which they differ from species since discovered. Of the generic diagnoses I will only say, that they too, are drawn exclusively from American species; the European student must not therefore be surprised if minute differences should be found between the descriptions herein given, and those already published from the European analogues.[1] In very few of the genera of Pselaphidæ are the minute relations of the cephalic organs preserved without variation through an entire genus; and thus the palpi of the *Tyrus* I have described, will be seen to differ appreciably from Aubé's description. I would also invite the attention of foreign observers to the fact, that the antennæ of the genus *Bry-*

[1] Having had no opportunity of observing the European species of such genera, I prefer taking this course, allowing my descriptions to differ slightly from those heretofore published, to having the responsibility of ordering any alteration in the former descriptions, or so modifying them as to include the species of both continents. Since the differences are now pointed out in these instances, it will be easy for any one by simple inspection of the foreign species, to perceive where these alterations must be made.

axis are provided with only ten joints, when the medial thoracic fovea is larger than the lateral ones, or when these last are entirely wanting. I have not yet succeeded in finding which joint becomes obsolete, but it would be very interesting to follow this up by the aid of foreign species, and to ascertain whether other forms than those specified are also embraced in the division with ten-jointed antennæ. The genus *Batrisus* having been very much increased, it became necessary to search for some means of dividing it into groups. The structure of the front has enabled me to do this in a tolerably natural manner, and thus to point out more clearly the specific characters belonging to each; and the peculiar sexual variations established under each group, will be sufficient proof that I have not unnecessarily multiplied the species of this heretofore limited genus. The characters used by me in dividing this genus having unfortunately been passed over in a negligent manner by former writers, I am still uncertain about the position of the foreign species, and of the relation which they bear to ours: I have, however, for the sake of uniformity endeavored to intercalate them as well as their descriptions would permit me.

The parallelism of the productions of the two continents is seldom more beautifully displayed than in the present group. There is now but a single European genus (*Bythinus*,) which has not its representative or its analogue in this country. As will be seen by the following table, this correspondence extends in a remarkable manner through the species of which the genera are composed, so that almost every species of the genera common to the two continents has its exact equivalent: moreover in those genera, which, from possessing less power of variation, consist only of single species, the parallelism of characters is still kept up to a most surprising extent; so much so, that if we were to leave out all strictly generic characters, the two analogues would be represented by a single diagnosis.

In addition to these equivalents and analogues we have still remaining many genera and species without representa-

tives in Europe; a fact which leads me to infer that the total number of species of Pselaphidæ in North America, notwithstanding the rarity of the individuals, is larger than in the corresponding part of the other continent.[1]

TABLE OF CORRESPONDING GENERA AND SPECIES.

Europe.	*United States.*
Batrisus, 4 species.	Batrisus, 17 species. (18 ?)
Chennium bituberculatum.	Ceophyllus monilis.
	Cedius, 2 species.
Faronus Lafertei.	Faronus ? Tolulæ.
Ctenistes, 2 species.	Ctenistes, 2 species.
	Tmesiphorus, 2 species.
Tyrus mucronatus.	Tyrus compar.
	Hamotus humeralis.
Pselaphus, 2 species.	Pselaphus, 2 species.
Tychus, 4 species.	Tychus, 2 species.
	Arthmius globicollis.
Bryaxis sanguinea.	Bryaxis conjuncta.
fossulata.	dentata.
three others.	
Lefebvrii.	velutina.
hæmatica.	hæmatica.
Helferi, Schüppelii.	abdominalis.
juncorum.	puncticollis.
Chevrieri.	
opuntiæ.	rubicunda.
impressa.	propinqua.
antennata.	lunifer.
	tomentosa.
	3 sp. (antennis, 10-articulatis.)
Bythinus, 13 species.	
	Eupsenius glaber.
	Rhexius insculptus.
Euplectus, 17 species.	Euplectus, 10 species.
Claviger, 3 species.	Adranes cœcus.

[1] This paragraph was written before undertaking a recent journey to the upper part of Georgia, and the result of that trip was such as to show abundantly the truth of the inference; and to prove that by a careful analysis of even limited material, we may be able to see the general operation of nature's laws, even before the results of these laws become evident; and thus to predict, as it were, the general nature of the distribution of any particular group of organized beings. During a stay of four weeks in upper Georgia, eighteen new Pselaphidæ were obtained.

It will be seen that notwithstanding the difference in the structure of the palpi, I have placed *Ceophyllus* as the American analogue of *Chennium*. The form of the body, and in fact the external characters are exactly similar in the two genera. And on account of the variation above-mentioned, of the cephalic organs, and especially of the palpi, (as noticed in *Tychus* and *Ctenistes*,) it is obvious that a similarity of structure in these organs is not necessary to a strong affinity between two species; and I have in this instance considered it of secondary importance, as compared with the general habit, and the very peculiar structure of the antennæ.

It will be observed too, in comparing a number of species of any genus of Pselaphidæ, that however much the relative proportions of the joints of the antennæ vary, there is still a particular appearance, depending perhaps on the method of articulation, which enables a practised eye at once to recognize the antennæ of each genus. On this account I have been led to consider in this group the structure of the antennæ as of fundamental importance in arriving at a philosophical arrangement of the genera in their mutual relations.

The differences already alluded to are, however, so slight as scarcely to be appreciated in a description. Not so with the manner of insertion of these organs; here we find great and important variations: many having the antennæ inserted under the front, as in many *Brachelytra*; while others have the front porrected and elevated into a narrow tubercle, upon or under which the antennæ are inserted.

Using this principle of division, the genera fall into two very natural series, which to some extent repeat each other.[1]

[1] Another reason why I consider the position of the antennæ as of primary importance in the division of this group, rather than the number of the articulations of the antennæ, and the tarsal claws, which are the bases of Aubé's tables, is that the character selected by me is entirely independent of particular stages of development. After the light which has been thrown by embryological researches, on the true signification of allied animals, scarcely any naturalist will be inclined to deny the existence of *series* in nature, which starting from a common origin, of low organization, can be traced in different directions to very diverse forms. The particular members of each series therefore stand in a linear relation to each other, and mark

Antennæ approximatæ.

a. Tarsi didactyli.

Chennium.
Ceophyllus.
Cedius.
Tmesiphorus.
Ctenistes.
Tyrus.
Phamisus.

b. Tarsi sesquidactyli.

Metopias.

c. Tarsi monodactyli.

Pselaphus.
Tychus.
Claviger.
Adranes.
Articerus. (?)

Antennæ distantes.

a. Tarsi didactyli.

Hamotus.
Faronus.

b. Tarsi sesquidactyli.

Batrisus.

c. Tarsi monodactyli.

Bryaxis.
Eupsenius.
Arthmius.
Bythinus.
Rhexius.
Euplectus.

the progressive material evolution of the intellectual idea, previously existing in the mind of the Creator, until the perfection of this idea is attained in the most highly organized member of each group. Gradually, too, as the primary idea is evolved, others seem to be brought out into greater prominence; so that the intermediate forms of a small group may be in direct relation with the lowest forms of a group standing higher in the same series. It is therefore obvious that if any group be defined by a character variable in the development of similar animals, that group is *ipso facto* not natural; because it indicates not a series, but a stage of development. However, it may be itself a particular stage of development in a group of higher value; but in this case the definition of the entire series will also be added to the definition of the group, and the latter will not be a distinctly limited collection of forms, but only a transitus from lower to higher species. The *primary principle* of division of any natural group *must* therefore be independent of any development which takes place after the animal has assumed a definite, peculiar, recognizable form. Now here Aubé's principles fail, because the number of the articulations of the antennæ and the tarsal claws varies from the larva to the imago, and therefore indicates stages of development. Hence if the group were compounded of smaller series, manifesting affinities in different directions, his arrangement would not render them evident, and they would remain rather matters of inference than demonstration. It is of course very difficult to detect these characters which are independent of development, because they are usually obscured by physiological developments, required by the habits of the animal, and the part it has to play in the economy of nature. But we must remember that the progress from artificial to natural classification has always been slow, and that we are *compelled* by the limitation of our own intellects, to make use of the former in order to attain the latter. Again, after having once discovered the true principle of definition, it is only necessary to make use of it in cases of difficulty, (as for instance, in the decision of the articulate nature of *Balanus*, the decomposition of the *Infusoria*, &c.) In all ordinary inquiries we associate with the primary idea such characters as are of less importance but more obvious, and which depend on the beautiful co-relation of parts evident throughout all nature.

The first group (with the front elevated,) is the normal form, and shows an unbroken series; *Metopias*, with its immarginate abdomen, being the inosculating point with *Batrisus*; which by slight variations in the form of its front, shows its tendency towards the typical stem.

The second group requires more careful analysis. The curious sculpture on the thorax of many of its members is not found in the first group, and should lead us to suspect that it may be the connecting chain with other forms. The embryonic character is plainly seen in the elongate form, and six-articulated abdomen of *Euplectus*; while in the other series, *Adranes*, though of very low organization, preserves the typical *Pselaphus* form. Of the two genera in this second series, *Hamotus* is plainly a *Bryaxis* form, while *Faronus* is a *Euplectus* form. Accordingly the genera must be thus arranged.

Scydmænoid genera.	*Oxyteloid genera.*
Hamotus.	Batrisus.
Bryaxis.	
Eupsenius.	Rhexius.
Arthmius.	"
Bythinus.	
B.	A.

Euplectus.
Faronus.

The left hand branch being almost typical *Pselaphi*, with globular thoraces, scarcely sculptured, and leading very obviously to the *Scydmæni*; the right-hand branch being altogether abnormal, *Batrisus* being the only genus tending at all to the typical chain. The six-jointed abdomen and elongate form of *Euplectus*, proves that the lower forms of this line must possess a multiarticulate abdomen, with a linear body. They must therefore be sought for among the *Brachelytra*. Now the three-jointed tarsi, (which must of course be preserved through the lower forms,) occur only in Erichson's division *Staphylini Oxytelini*, where we also find sculptured thoraces agreeing with those of our *Pselaphidæ*.

Looking at the contents of this family, as left by Erichson, we see much heterogeneous material; *Megalops* and *Osorus* differ at once by their corneous ligula; the latter also by the insertion of its antennæ into a very deep cavity. The remainder divides itself naturally into two groups: *Oxy. genuini*, (Er.) tarsi 3-articulati, palpi articulo ultimo subulato, and *Oxy. coprophilini*, (Er.) tarsi 5-articulati, palpi filiformes. The first of these contains the forms after which we were looking; the second being the diverging line to the *Omalini*. Comparing now the *Oxytelini genuini* with *Euplectus*, we perceive a most close agreement in structure as well as appearance. The antennæ, feet, and sutures of the thoracic segments are all similarly situated, while the relations between the parts of the mouth are identical. In the genus *Faronus*, (although furnished with two claws,) we perceive other *Oxyteloid* characters, in the shortening of the second tarsal joint, and the structure of the abdomen.

We have now got a large group containing *Pselaphi*, *Scydmæni*, and *Oxytelini*, which seem from the affinities just mentioned, to be very closely related. To circumscribe this group, and to discover its higher forms, (if any exist,) is a work of much labor, and could be undertaken only after a careful study of all the groups of *Coleoptera*, and a knowledge of their larvæ. Although much labor has been given to the latter subject, our information is still too imperfect for general systematic inquiries. Since the *Coleoptera* have heretofore been studied for the purpose of being arranged into groups rather than series, many characters used in defining these groups must be rejected, when we attempt to find the relations of these to each other. (*Vide* note on page 68.) In fact, a too strict adherence to characters indicating states of development, has already led to the formation of two very heterogeneous tribes, the *Brachelytra* and *Heteromera*; the latter containing many embryonic forms, known by their softness, and imperfect structure, while the former is a general receptacle for all larval forms with a corneous abdo-

men. The first effort to decompose this tribe has herein been made by joining the *Oxytelini* and *Omalini* with the *Pselaphi*; and in future memoirs, I hope to point out how some other portions of the *Brachelytra* may be disposed of.

The results already obtained by systematists in the formation of these two heterogeneous groups, with such opposite characters, and some considerations derived from the larvæ, will point out the proper course to be taken in these investigations.

On looking at a number of larvæ of *Coleoptera*, we at once perceive great differences in their tegumentary system. Some are cylindrical and soft, while others are more or less flattened, and protected by corneous scuta. Accordingly, there will be some embryonic groups having a soft consistence, and these will belong to the series with soft larvæ; other embryonic forms, derived from corneous larvæ, must have likewise a hard covering, and these will retain the free multi-articulate abdomen, and will in fact be *Brachelytra*.

As the corneous tegument of some larvæ of *Elateridæ* and *Tenebrionidæ* is of a different structure, since it is not arranged in a scutate manner, but is a hardening merely of the membranous skin seen in other larvæ of the same tribes, we must by no means infer, that the lower members of these groups are *Brachelytrous*. In such cases, the hardening being merely a further development of the usual structure, will merely serve to point out the higher members of the groups in which it occurs.

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Ceophyllus.

Antennæ approximatæ, 11-*articulatæ, moniliatæ, sub fronte elevata in fovea insertæ.*

Palpi maxillares 4-articulati, articulis 3^{tio} *et* 4to *clavam transversam formantibus. Mentum basi angustatum.*

Tarsi unguiculis binis æqualibus.

Corpus antrorsum sensim angustatum: caput elongatum, parallelum, fronte inter antennas valde elevata, fovea utrinque laterali profunda, ad antennarum insertionem; antennæ articulis omnibus globosis, 1mo paulo oblongo; labrum transversum, brevissimum; mentum versus basin sensim paulo angustatum: palpi maxillares, 4-articulati, articulo 2^{ndo} longissimo, fusiformi basi tenuissimo, 3^{tio} pedicello tenuissimo, ad apicem subito extrorsum valde dilatato, antice paulo concavo; 4to transverso, angusto, parte articuli 3^{tii} dilatata æquante, et cum ea clavam lamellatam formante. Elytra planiuscula, apice triangulariter parum declivia; abdomen anguste marginatum, antice planiusculum. Pedes elongati, trochanteres antici spina acuta armati; femora antica subtus acute 1-spinosa; tarsi articulo 2^{ndo} et 3^{tio} æqualibus, hoc unguiculis binis æqualibus.

Nomen a κέω, *findo,* et φύλλον, *folium,* derivatum.

1. C. monilis. *Cinnamomeus, subtiliter punctulatus, breviter dense pubescens, fronte elevata, medio foveata, thorace linea arcuata basali, elytris stria profunda ad medium abbreviata.* Long. .11.

Specimen unicum ad fluminis St. Clair, (Michigan,) ripas, sub cortice Tiliæ Americanæ, mense Augusto, inveni.

Cinnamomeus, dense, brevissime pubescens. Caput utrinque supra oculos concavum, his minutis, rotundatis; fronte elevata antice subacuta, pone antennas fovea oblonga impressa; minus dense subtiliter punctatum: antennæ dimidio corporis longiores, articulis globosis, 9 et 10 præcedentibus paulo minoribus, ultimo paulo longiore, ovali. Thorax latitudine sesqui longior,

antice parum angustior, utrinque fere truncatus, lateribus paulo rotundatus, ante apicem obsolete transversim impressus, lineaque arcuata basali tenui insculptus; subtilissime punctulatus, margine antica lævi. Elytra thorace duplo latiora, antrorsum sensim angustata, lateribus fere rectis, apice recte truncata, subtilissime punctulata, stria profunda dorsali ad medium abbreviata. Abdomen subtilissime punctulatum.

Cedius.

Antennæ approximatæ, 11-*articulatæ sensim incrassatæ, ad marginem frontis elevatæ subtus insertæ.*

Palpi maxillares 4-articulatæ, art. 3[tio] *cuneiformi extus acuto,* 4to *majore convexo; mentum quadratum.*

Tarsi unguiculis binis æqualibus.

Corpus antrorsum sensim angustatum, caput subelongatum, lateribus antice parallelum, pone oculos angustatum, fronte inter oculos valde elevata, utrinque ad antennarum insertionem excavata, subtus oculos spina acuta armatum, oculi parvi rotundati: antennæ articulis 2–7 cylindricis subæqualibus, 1mo majore, quatuor ultimis sensim majoribus: mentum quadratum: palpi maxillares 4-articulati, articulo 2[ndo] longissimo, valde curvato, versus apicem paulo clavato: 3[tio] transverso, cuneiformi, intus acuto; 4to majore, ovali convexo, appendice brevissima terminali instructo. Elytra convexiuscula. Abdomen marginatum, convexiusculum. Pedes elongati, trochanteres antici spina longa armati, femora antica subtus acute longeque spinosa; tarsorum articulo 3[tio] quam 2[ndo] paulo longiore, unguiculis binis æqualibus.

Nomen a κήδειος, *carus.*

1. C. Ziegleri. *Fusco-rufus, densius pubescens, thorace linea basali arcuata, elytris densius punctulatis, stria profunda parum abbreviata, pedibus anticis basi 3-spinosis.* Long. .11.

Habitat in Pennsylvania sub cortice arborum; a Dom. Ziegler, cui, entomologo fideli, grato animo, inscriptus est, benevole datus.

Fusco-rufus, parum nitidus, pube densiore fulva vestitus. Caput parcius punctatum, supra oculos concavum, his parvis rotundatis prominulis: fronte elevata, antice acuta, inter antennas profunde valde excavata, inter oculos transversim impressa: antennæ capite cum thorace paulo longiores, articulis 4 ultimis sensim crassioribus, ultimo præcedentes duos æquante, ovali: 8vo subtus acute parum producto. Thorax convexus, latitudine non longior, antice paulo latior, rotundatus, basi truncatus, ante basin linea arcuata insculptus, parcius subtiliter punctulatus. Elytra thorace plus sesqui latiora convexiuscula, lateribus rotundata, antrorsum angustata, subtiliter densius punctulata, stria dorsali profunda, ad apicem parum abbreviata. Abdomen sat dense subtiliter punctatum, apice acutiusculum. Trochanteres antici acute longeque spinosi, femora antica subtus longe bispinosa.

2. C. spinosus. *Rufus pubescens, thorace linea basali arcuata, elytris parcius punctulatis, stria dorsali ad medium abbreviata, pedibus anticis basi bispinosis.* Long. .07.

Habitat in Carolina Australi, Columbiæ. Dom. Zimmerman.

Forma præcedentis; quadruplo minor, minus dense pubescens. Caput idem, antennæ similes, apice autem paulo magis incrassatæ. Thorax impunctatus, linea arcuata basali insculptus. Elytra convexiora, parcius punctulata, stria dorsali ad medium abbreviata. Abdomen subtiliter punctulatum. Trochanteres antici spiniferi. Femora antica basi spina longa armata.

Tmesiphorus.

Antennæ approximatæ, 11-*articulatæ, sensim clavatæ, ad frontis elevatæ marginem subtus insertæ.*

Palpi maxillares 4-articulati, articulo 2^{ndo} *et* 3^{tio} *extus appendiculatis,* 4to *triangulari emarginato. Mentum quadratum.*

Tarsi articulo 3^{tio} *quam* 2^{ndo} *sesqui longiore, unguiculis binis æqualibus.*

Corpus subelongatum, antrorsum angustatum, minus convexum. Caput triangulare, fronte inter antennas elevata, utrinque ad antennarum insertionem excavata; subtus oculos spinis duabus brevibus, quarum anterior acuta est; oculis transversis convexis, prominulis; antennæ sensim clavatæ, ad marginem frontis elevatæ subtus insertæ, articulo 1mo majore oblongo, 2–8 subæqualibus, gradatim paulo brevioribus, 3 ultimis sensim majoribus: mentum quadratum: palpi maxillares elongati, articulo 2^ndo^ longo, valde curvato, basi tenui, apice modice clavato, appendice setiformi externa ante apicem; 3^tio^ latitudine duplo longiore, subfusiformi, appendice externa setiformi ad medium; 4to dilatato, triangulari, apice oblique emarginato, angulo interno longiore, appendice brevissima instructo. Elytra planiuscula, margine humerali acuta; abdomen late marginatum. Pedes elongati, tarsorum articulo 3^tio^ quam 2^ndo^ sesqui longiore, unguiculis 2 subæqualibus, interno vix conspicue tenuiore.

Genus certe Ctenisti valde affine, at palporum structura tarsorumque articulo 2^ndo^ breviore distinctum haberi debet.

Nomen a τέμνω et φέρω.

1. T. carinatus. *Fusco-rufus, pubescens, capite inæquali thoraceque dense punctatis, elytris punctatis, carina ad medium abbreviata, abdomine punctulato 3-carinato, carina media integra.* Long. .08–.10.

Habitat sub cortice pinuum et quercuum, minus frequens. Ohio, Alabama, Pennsylvania. Abundat in Georgia.

Pselaphus carinatus *Say*, J. Ac. N. Sc. 4, 97.

Ctenistes? carinatus, *Aubé* An. Ent. 2, 100.

Fusco-rufus, pube depressa fulva parce vestitus; caput dense punctatum, fronte elevata excavata, occipite carinato, bifoveato: antennæ articulis 2–8 cylindricis sensim paulo brevioribus, 9 et 10 majoribus, æqualibus, 11mo adhuc majore et crassiore ovali, apice rotundato. Thorax capite non latior, latitudine vix longior, antice rotundatus paulo latior, basi truncatus, convexus, confertim punctatus, fovea parva oblonga basali

notatus. Elytra thorace fere duplo latiora, antrorsum angustata, basi profunde impressa, sat dense minus subtiliter punctata, costa ad medium abbreviata distincta, quæ stria externe definita est: costula altera obsoleta externa apicali versus marginem humeralem elevatam tendit. Abdomen punctulatum, carina media acuta, ad segmentum 4^{tum} extendente; segmento primo carina altera utrinque tenui ornato.

Mas antennarum articulo 10mo ad apicem intus parum producto, 11mo inferne versus basin paulo sinuato-emarginato, dentulo minimo armato, carinisque abdominis externis in segmentum secundum prolongatis differt.

2. T. costalis. *Nigro-piceus, nitidus, parum pubescens, capite inæquali, thoraceque punctatis, elytris lævibus, costa ad medium abbreviata, abdomine lævissimo, antice bicarinato.* Long. .11.

Specimen unicum in Pennsylvania mense Aprilo sub cortice inventum, a Dom. Haldeman amice datum.

Præcedente major, parcius pubescens, nigro-piceus: caput dense punctatum, fronte elevata profunde longitudinaliter impressa, fere fissa: occipite obsolete trifoveato, fovea intermedia posteriore oblonga. Antennæ articulis 2–8 paulo rotundatis, sensim parum brevioribus, 9 et 10 majoribus æqualibus, 11mo majore, sub-securiformi, oblique subtruncato, apice fere acuto. Thorax latitudine vix longior, basin versus subangustatus, truncatus, lateribus ante medium obtuse rotundatim angulatis, dense punctatus. Elytra thorace fere duplo latiora, antrorsum angustata, ad apicem truncata, paulo declivia, basi profunde impressa, lævia, sutura tenuiter marginata, costa ad medium extendente. Abdomen lævissimum, segmento primo utrinque versus latera subtiliter carinato, carinis in segmentum 2^{dum} paulo prolongatis.

Sexus differentia latet, verisimiliter in antennarum articulo ultimo quærenda: specimen descriptum forte masculinum.

Ctenistes Reichenbach.

Antennæ approximatæ, sensim clavatæ, ad marginem frontis elevatæ subtus insertæ.

Palpi maxillares 4-articulatæ, articulis 2, 3, et 4 appendice externa elongata lineari auctis, 2 longo, curvato, apice clavato, 3 et 4 transversis, convexis.

Mentum quadratum, antice subemarginatum.

Tarsi articulis 2 et 3 æqualibus, hoc unguiculis binis æqualibus.

Confer Aubé, An. Ent. 2, p. 96, quo characteres genericas perspicue pleneque representari videbis.

Victus sub cortice, et ligni fragmentis.

1. C. piceus. *Elongatus, depressus, piceus, pube albida sparse vestitus, capite subreticulato, postice late bifoveato, thorace lateribus rotundato, basi foveato, palpis articulo ultimo apice rotundato.* Long. .08.

Habitat in Vermont. Dom. C. B. Adams.

Sequenti major, et thoracis forma distinctus. Nigro-piceus, nitidus; caput leviter reticulatum, inter oculos late profundius bifoveatum, carinula intermedia vix conspicua, inter antennas fovea oblonga impressum, tuberculoque minimo subocular munitum. Antennæ extus leviter incrassatæ, articulo ultimo præcedentes tres longitudine æquante. Thorax latitudine vix brevior, basi truncatus, antrorsum angustior, lateribus rotundatis, fovea oblonga basali impressa maculaque versus marginem minuta albida pubescente. Elytra lateribus rectis, stria dorsali subtilissima integra. Abdomen apice rotundatum; pedes rufi.

Mas antennarum articulis 8–10 sensim paulo crassioribus, oblongis, latitudine vix longioribus, ultimo crassitie plus duplo longiore.

Femina antennarum articulis 8–10 sensim crassioribus,

rotundatis, subtransversis, ultimo crassiore, crassitie vix duplo longiore.

2. C. Zimmermani. *Elongatus, depressus, testaceus, parce pubescens, capite inter oculos late bifoveato, thorace lateribus parum rotundato, basi foveato, elytris stria dorsali tenui, palpis articulo ultimo apice rotundato.* Long. .07.

Habitat in Georgia et Louisiana. Dom. Lud. Le Conte. Specimina Nov. Aureliani lecta a Dom. Schaum, sub nomine dicato missa.

Testaceus, nitidus, pube brevi parce vestitus. Caput fere læve, inter oculos late minus profunde bifoveatum, inter antennas linea longitudinali brevi insculptum; tuberculo minimo suboculari instructum. Thorax latitudine non longior, basi truncatus, antrorsum angustatus, lateribus vix rotundatus; fovea oblonga basali, maculaque minuta utrinque versus latera albido-pubescentibus. Elytra lateribus rectis, stria dorsali subtilissima fere integra. Abdomen ad apicem minus late rotundatum.

Mas antennis paulo longioribus, extus vix incrassatis, articulis 9 – 10 oblongis, ultimo cylindrico, crassitie triplo longiore.

Femina antennis extus crassioribus, articulis 9 – 10 rotundatis, ultimo ovali, crassitie duplo longiore.

3. C. consobrinus. *Elongatus depressus, piceus pubescens, capite subreticulato, inter oculos impresso, thorace antice subangustato, basi foveato; elytris stria dorsali profunda, palporum apice rotundata.* Long. .07.

Specimen unicum masculinum ad Athenas Georgiæ inventum.

Statura omnino præcedentis, at magis pubescens; capite subreticulato, fronte canaliculato, foveis posticis confluentibus; thorace antice sub angustato, lateribus paulo rotundatis, striaque dorsali elytrorum profunda distinctus.

Tyrus Aubé.

Antennæ approximatæ, 11-*articulatæ, ad apicem sensim clavatæ, ad frontis elevatæ marginem subtus insertæ.*

Palpi maxillares 4-*articulatæ, articulo* 2^{ndo} *longo, apice clavato,* 3 ^{tio}, 4to *que ovalibus, hoc paulo majore, apice acuminato, appendiculatoque.*

Mentum quadratum.

Tarsi articulo ultimo paulo longiore, unguiculis binis æqualibus.

Vide Aubé, An. Ent. de Fr. 2nd ser., tom. 2, p. 90.

Speciem sub tus descriptam generi Tyro adjungere ausus sum : dissuadente tamen clarissimo amico meo Schaum, cui potius Hamotus verus apparuit. Certe cum specie nostra H. humerali (Aubé, mihi ignota,) minime congruit, et quoad antennarum insertionem, inter hanc speciem et Ctenistem Zimmermani differentiam ullam perspicere non possum. Aubé porro in Hamoti descriptione, palporum articulum 3^{tium} minutum triangulare laudat, dum insectum nostrum parte illa ovoidea, vel etiam clavata, basi tenuissima, articulo ultimo parum minore valde abhorret.

1. T. compar. *Subelongatus, piceus, antennis pedibus elytrisque rubris, capite antice sulcato, vertice bifoveato, thorace linea arcuata basali foveisque insculpto; trochanteribus anticis vix productis, obtusis.* Long. .07 – .08.

Habitat in Georgia et Carolina sat frequens ; specimen alterum in Territorio Missouriensi inveni.

Subelongatus, convexiusculus, piceus nitidus, parcius pubescens. Caput fronte elevata, inter antennas profunde sulcata, sulculo in fovea desinente : vertice inter oculos foveis 2 majusculis. Antennæ capite cum thorace longiores, articulis 3 – 8 æqualibus, subrotundatis, 9 – 10 crassioribus, subtransversis, ultimo præcedentes duos æquante, crassiore, ovato, apice obtuso, totæ rufo-ferrugineæ, pubescentes. Thorax latitudine vix longior, convexus, antrorsum rotundatus, basi subtruncata, linea arcuata utrinque in fovea rotundata desinente, alteraque media transversa vix distincta insculpta. Elytra convexiuscula, antrorsum angustata, lateribus rotundata, rubra, stria dorsali ante apicem abbreviata, profunda. Pedes ferruginei,

trochanteres antici vix prominuli, intermedii triangulares, apice producti: femora antica medio subtus paulo prominula, at non dentata.

Mas trochanteribus mediis apice acutioribus distinctus.

PSELAPHUS Herbst.

Antennæ 11-*articulatæ, approximatæ, ad frontis elevatæ marginem insertæ.*

Palpi maxillares longissimi, articulo 3^tio^ *minuto,* 4to *elongato clavato.*

Mentum basi angustatum.

Abdomen marginatum articulo 1mo *maximo.*

Tarsi unguiculo unico.

Genus forma elongata, antrorsum angustata, depressa, palpis longissimis facile distinguendum.

1 P. longiclavus. *Piceus, elytris sanguineis, thorace elongato, subcylindrico, palpis articuli ultimi pedunculo clavæ æquali, hac crassitie triplo longiore.* Long. .07.

Habitat in provinciis australibus, a D. Schaum benevole datus. P. Heisei Europæ simillimus, et palpis aliter clavatis solum differt. Palpi maxillares articulo ultimo, thorace vix breviore, a medio usque ad apicem sensim parum clavato, clava crassitie triplo longiore, vix pubescente.

2. P. Erichsonii. *Castaneus, elytris dilutioribus, thorace elongato, subcylindrico, palpis articulo ultimo subito clavato, pedicello clava duplo longiore.* Long. .065.

Specimen unicum Nov. Eboraci lectum a Dom. Wallace benevole datum. Ad memoriam beati ERICHSONII hæc species in opere suo Col. March. 1, 267 citata, tristi animo inscribitur.

Species præcedenti simillima, at paulo minor; et palporum articulo ultimo subito clavato, clava elliptica, crassitie vix duplo longiore, pedicello vero duplo breviore, facile distinguenda.

Tychus Leach.

Antennæ 11-*articulatæ, approximatæ, ad frontis elevatæ marginem subtus insertæ, sensim clavatæ.*

Palpi maxillares longissimi articulo 3^{tio} *et* 4to *elongatis, triangularibus.*

Mentum quadratum.

Abdomen marginatum, articulis subæqualibus.

Tarsi unguiculo unico.

Genus Pselapho certe affinis, differt autem palpis aliter formatis, mandibulis prominulis, abdominisque articulo 1mo reliquis vix majore.

Corpus elongatum minus depressum, elytris thorace latioribus subparallelis; palpi maxillares longissimi, antennis vix breviores, articulo 2^{ndo} tenuissimo, apice sensim clavato, 3^{tio} sesqui breviore plano, triangulari, intus appendice brevi (in speciebus nostris,) instructo; 4to majore securiformi, angulis rotundatis, apice seta tenui aucto. Mandibulæ acutæ curvatæ, porrectæ. Thorax capite latior, rotundatus. Antennæ elongatæ.

1. T. longipalpis. *Rufus, pubescens, fronte leviter sulcata, verticeque subcanaliculato, thorace fere globoso.* Long. .08.

Habitat in Carolina. Dom. Zimmerman.

Elongatus, rufus nitidus pubescens. Caput tuberculo frontali leviter sulcato, pone antennas transversim paulo impressum, vertice longitudinaliter impresso. Antennæ articulis 3–8 æqualibus, rotundatis, 9 et 10 duplo crassioribus, globosis, ultimo ovato apice acuto crassiore, præcedentibus 2 æquali. Thorax rotundatus, capite sesqui latior, basi fovea parva ad medium, alteraque utrinque ad latera impressus. Elytra thorace sesqui latiora, antrorsum parum angustata, modice convexa, stria dorsali pone medium abbreviata. Pedes elongati, simplices.

Sexus differentia mihi ignota.

2. T. minor. *Rufus, parce pubescens, fronte profunde*

divisa, capite arcuatim impresso, vertice convexo, thorace antrorsum subangustato. Long. .06.

Specimen unicum e valle Nakutshi, Georgiæ.

Præcedente plus duplo minor, antice magis angustatus, saturate rufus, parce pubescens. Caput fronte profunde breviter diviso; arcuatim impressum, vertice convexo, lævi. Antennæ omnino sicut in præcedente. Thorax latitudine paulo longior, ad apicem angustatus, ad basin punctis 3 vix conspicuis impressus. Elytra sicut in priore.

Adranes.

Antennæ approximatæ, 2-articulatæ, articulo 2^{ndo} longissimo truncato.

Palpi maxillares brevissimi, (biarticulati?).

Oculi nulli.

Abdomen supra excavatum, articulo 1mo maximo.

Tarsi unguiculo unico, articulis 2 primis obsoletis.

Genus Clavigero similis, antennis autem biarticulatis, corporeque depresso distinctus. Oris partes tam rudimentales, sine sectione haud rite visendæ: nomen ab ἀδρανής, *imbecillis,* derivatur.

Corpus depressum antice valde angustatum.

Caput angustum, antice utrinque lateraliter excavatum, antennis valde approximatis in excavatione insertis, fronte paulo elevata; utrinque in medio puncto laterali saliente in oculorum situ. Abdomen marginatum subtus 5-articulatum, supra vero 3-articulatum, articulo 1mo maximo, excavatione magno basali, cum mamilla parva flavo-pubescente utrinque ad marginem. Elytra angulo externo apicali rotundato, ita ut ad apicem angulato-rotundata apparent. Pedes omnes inarmati, tarsorum articulis basalibus inconspicuis, (vel omnino nullis.)

1. A. cœcus. *Testaceus, punctatus, brevissime pubescens, abdomine lævissimo, glabro, thorace basi foveato.* Long. 08.

Specimen unicum ad Montis Jonæ (Georgiæ) apicem, cum formica parva nigerrima, abdomine cordato, a Dom. W. L. Jones amice inventum.

Depressus, saturate testaceus, brevissime pubescens, sat dense punctatus. Antennæ capite sesqui longiores, articulo basali parvo, secundo longissimo, sensim clavato, apice truncato. Caput latitudine duplo longius, medio utrinque parum prominulo. Thorax capite duplo latior, latitudine non brevior, ante medium subito angustatus, basi truncata, medio fovea oblonga majuscula impressus. Elytra antrorsum valde angustata, lateribus fere rectis, sutura non marginata, ad apicem in medio utrinque flavo ciliata. Abdomen glabrum, lævissimum, mamilla utrinque basali flavo-tomentosa; excavationis pars antica triangulariter profundius impressa.

Hamotus Aubé.

"Antennæ moniliformes, apice clavatæ, in fossula lateralis frontis insertæ. Palpi maxillares 4-articulati, articulo ultimo fusiformi." Tarsis unguiculis binis æqualibus.

Habitus generis Bryaxis, abdominis autem articulis æqualibus, tarsisque biunguiculatis differt. Palpi maxillares modice elongati, articulo 2ndo clavato, elongato, 3tio minuto triangulari, ultimo 2ndo fere æquali, fusiformi.

An rite hic ponendum hoc genus? Palporum structura ad genus meum Cedium supra descriptum valde approximat; sed antennarum insertionem in iisdem verbis sicut in Bryaxis descriptione declarat Cel. Dom. Aubé, (An. Ent. l. c. 91, 103.) Si antennæ revera approximatæ sunt, ad seriem primam meam pertinet hoc genus, et inter Cedium et Tyrum ante Tmesiphorum locum teneat.

1. H. humeralis. *Elongatulus, convexiusculus, rufo castaneus, abdomine nigro, capite subtilissime reticulato, vix bipunctato, thorace ovato foveolis tribus linea arcuata connexis impresso.* Long. 1⅔ mill.

Habitat in Carolina boreali, mihi ignotus.

Aubé, l. c. 93. Frontem antice canaliculatam declarat, antennarumque articulum ultimum præcedentibus 2 æqualem, apice obtusum: elytra stria dorsali profunda, integra.

Bryaxis, Leach.

Antennæ basi modice distantes, in fossula sub frontis margine insertæ.

Palpi maxillares 4-articulatæ, articulo 4to *fusiformi.*

Mentum cordatum, basi angustatum.

Abdomen marginatum, articulo 1mo *majore.*

Tarsi unguiculo singulo.

Vide Aubé, An. Soc. Fr. l. c. 103. Corpore convexo thoraceque foveato facile distinguendum hoc genus.

1. B. conjuncta. *Nigra nitida, elytris sanguineis, thorace globoso, foveis tribus, intermedia minore, sulco arcuato connexis, antennis pedibusque rufis.* Long. .08.

Habitat in provinciis orientalibus.

B. sanguineæ Europæ simillima, differt tamen fovea thoracis intermedia minore, antennisque aliter clavatis.

Mas antennis longioribus, articulis 9–10 præcedentibus duplo crassioribus, ultimo oblongo, apice subacuto, illis conjunctis fere longiore, at non crassiore, trochanteribus anticis spinosis, tibiis anticis medio intus dentatis, postpectore utrinque postice acute prominulo, medio excavato.

Femina antennarum articulis 9–11 sensim crassioribus, ultimo majore ovato, 9no præcedente vix majore.

2. B. dentata. *Nigra, nitida, elytris sanguineis, capite trifoveato, thorace postice angustato, foveis magnis æqualibus vix conjunctis, externis in lateribus ipsis impressis.* Long. .08.

Habitat ubique minus frequens, Mass., Nov. Ebor., Illinois.

Pselaphus dentatus *Say,* J. Ac. Nat. Sc. 4, 99.

B. xanthopteræ (Aubé An. Ent. Soc. l. c. 107,) simillima videtur, et thoracis solum forma differre. Parva, nigra nitida. Caput trifoveatum. Antennæ corporis dimidio æquales, articulis 3–8 sensim parum brevioribus, 9no paulo crassiore, 10mo

duplo crassiore transverso, ultimo ovato, longitudine præced. 3 æquali, apice subacuto. Thorax subglobosus, utrinque tamen angustatus, medio rotundatim angulatus, foveis 3 magnis basalibus, obsolete connexis, externis in ipso latere impressis. Elytra sanguinea, stria dorsali obliqua ante apicem obsoleta, abdominis articulo 1mo reliquis conjunctis æquali, basi brevissime bistriato. Pedes rufi. Mas latet.

3. B. velutina. *Minuta, rufa, longius pubescens, thorace subtransverso, ad basin fovea magna, alteraque minore utrinque in latere impressa, elytris parce subtilissime punctulatis.* Long. .05.

Habitat Nov. Aureliani, frequens, a D. Schaum, sub nomine dicato benevole missa.

Præcedente duplo minor, rufus, convexus, longius pubescens. Caput utrinque leviter impressum, postice foveis 2 magnis. Antennæ breviusculæ, articulis 3–9 æqualibus rotundatis, 9no paulo crassiore, 10mo iterum duplo crassiore, transverso, ultimo ovato, apice rotundato, præcedentes 3 æquante. Thorax convexus, subtransversus, lateribus valde rotundatus, fovea magna in basin mediam, alteraque utrinque minore in ipso latere impressus. Elytra parce obsolete punctulata, stria dorsali parallela, tenui apice obsoleta. Abdomen articulo 1mo reliquis conjunctis æquali, usque ad medium bistriato.

Sexus differentia me evadit.

4. B. abdominalis. *Rufo-testacea, thorace lateribus subangulato, foveis* 3 *æqualibus impresso, abdominis articulo* 1mo *sequentibus paulo majore, elytris subtiliter punctulatis, trochanteribus anticis muticis.* Long. 08.

Habitat ad Cantabrigiæ (Mass.,) in pratis salinis, mense Maio, sat frequens, Nov. Eboraci rarius.

Bryaxis abdominalis *Aubé*, Mon. Ps. 27, tab. 82, fig. 2.

——— dentata ‡ *ej*. An. Soc. Ent. Fr. l. c. 112.

A sequente abdominis segmento 1mo paulo majore differt. *Vide* Aubé, l. c.

Mas abdominis articulo 1mo medio profunde excavato, utrinque gibboso, 2^{ndo} medio excavato, utrinque transversim gibboso, 3^{tio} postice 4-tuberculato.

5. B. hæmatica. *Rubro-cinnamomea, thorace lateribus rotundato, foveis 3 æqualibus impresso, abdominis articulo 1mo reliquis conjunctis majore, elytris subtiliter punctulatis, trochanteribus anticis muticis.* Long. .08.

Leach, Zoöl. Misc. 3, 86; *Aubé,* Mor. Ps. 26, tab. 82, 1, An. Ent. Soc. 111. Mihi ignota, an recte Americæ citata. In Europa sat frequens. Pro synonymia vide Aubé, l. l., et Er. Käf. Deutsch. 1, 269.

6. B. luniger. *Elongata, rufa, thorace punctulato, foveis 3 intermedia minore, sulculo tenui conjunctis, elytris subtiliter punctulatis, trochanteribus anterioribus armatis, antennarum articulo 1mo supra emarginato.* Long. .10.

Specimen unicum (femineum?) ad Cambridge in pratis salinis lectum.

Elongata, rufa, brevissime pubescens. Caput parce punctulatum, inter oculos bifoveatum, fronte impressa fere binodosa. Antennæ elongatæ, articulis 3–8 sensim brevioribus, rotundatis, 9$_{no}$ plus duplo crassiore transverso, subtus paulo magis producto, 10mo magno, supra profunde emarginato, appendice parva clavata pone emarginationem antice versa armato; ultimo ovato, crassitie fere duplo longiore. Thorax subglobosus, subtilissime punctulatus foveis 3 postice in disco impressis, intermedia paulo minore, his stria minus impressa arcuata fere connexis. Elytra subtilissime punctulata, stria dorsali parum obliqua. Abdomen articulo 1mo elongato. Pedes longiusculi; trochanteribus anticis et intermediis spinula armatis.

7. B. puncticollis. *Rufa capite lævi, thorace dense punctulato, fovea intermedia minima.* Long. .06.

Habitat Novi Aureliani, a Dom. Schaum benevole data.

A B. juncorum Europæ præcipue capite impunctato differt. Convexa rufa, breviter pubescens. Caput 3-foveatum. Antennæ articulis 3–7 æqualibus, oblongis, 8–10 sensim crassioribus, præced. paulo brevioribus, ultimo ovato, præcedentibus 3 æquali. Thorax subtransversus, lateribus subangulatus, dense subtiliter punctatus, fovea intermedia parva, externis magnis. Elytra impunctata, stria dorsali fere integra. Abdomen articulo 1mo paulo majore basi brevissime bistriato.

Mas pectore abdominisque articulo inferiore penultimo excavatis.

8. B. rubicunda. *Convexa picea, elytris sanguineis, thorace lateribus subangulatis fovea intermedia minore, antennis breviusculis, articulis intermediis oblongis, penultimis leviter discretis.* Long. .06.

Habitat ubique sat frequens. Nov. Eboraci, Georgia, Terr. Miss.

Aubé, An. Soc. Ent. Fr. l. c. 116.

Mas antennis paulo longioribus, tibiis intermediis calcare terminali brevissima armatis differt.

9. B. propinqua. *Convexa picea, elytris sanguineis, thorace fere globoso fovea intermedia minore, antennis breviusculis, articulis intermediis rotundatis, penultimis arctius conjunctis.* Long. .06.

Habitat ad Lacum Superiorum.

Præcedenti simillima, antennis vero structura, thorace globoso, lateribus regulariter rotundatis, fovea intermedia minore, elytris ad basin fovea parva inter striam et suturam impressis differt.

Mas antennis capite thoraceque parum longioribus, articulis 3–4 subæqualibus, 5to duplo crassiore at non longiore, 6–9 iterum minoribus, æqualibus, subtransversis, rotundatis approximatis, 10mo crassiore, transverso, ultimo ovali, 10mo non crassiore, 4 præcedentibus æquali: tibiis intermediis calcare minimo ad apicem armatis.

Femina, antennis capite thoraceque parum longioribus, articulis 3 – 8 crassitie æqualibus, sensim paulo brevioribus rotundatisque, 9no parum crassiore, 10mo iterum crassiore, majore.

Aubé Mon. Ps. 33, Tab. 84, I. ej. An. Ent. Soc. Fr. l. c. 113. Mihi ignota.

B. Antennis 10-articulatis.

10. B. abnormis. *Convexa, rufa impunctata, longe et dense pubescens capite bifoveato, thorace rotundato, fovea subbasali, antennis* 10-*articulatis*. Long. .06.

Habitat in provinciis mediis Australibus et Borealibus.

Statura B. rubicunda paulo major, convexa, picea, nitida, impunctata, dense longe pubescens. Caput postice bifoveatum fronte vix impressa. Antennæ breviusculæ, longius pilosæ, articulis 3 – 7 æqualibus, rotundatis, 8vo sesqui crassiore, 9no iterum crassiore et majore, his transversis subrotundatis, ultimo (10mo) majore ovali, apice subacuto, præcedentes 3 æquante. Thorax rotundatus, convexus, subtransversus, fovea subbasali in medio impressus. Elytra, sanguinea, convexa, stria dorsali paulo obliqua, pone medium abbreviata, profunda. Abdomen articulo, primo reliquis conjunctis majore, tenuiter bistriato. Pedes testacei, trochanteribus muticis.

Sexus differentia, nonnisi antennis maris paulo longioribus, me fugit. Species propter antennas 10-articulatas mirifica, sed aliter a Bryaxis typicis minime distincta.

11. B. longula. *Elongata, minus convexa, rufo-sanguinea, pubescens, abdomine obscuriore, thorace rotundato, postice medio foveato, elytris parce punctulatis antennis* 10-*articulatis*. Long. .06.

Habitat Nov. Eboraci et ad Lacum Superiorem minus frequens.

A præcedente, thoracis fovea majore, corpore elongato, minus convexo, elytrisque punctulatis distincta.

Rufo-sanguinea, abdomine obscuriore, elongata, minus convexa, nitida, sat dense pubescens. Caput 3-foveatum, fovea

antica minus distincta. Antennæ sicut in præcedente at minus pilosæ, articulo 3^{tio} paulo longiore. Thorax latitudine non brevior, lateribus magis rotundatis, fovea basali majore. Elytra lateribus fere parallelis, humeris rotundatis, parce, subtiliter punctulata, stria dorsali tenui fere integra. Abdomen quam in præcedente longius; pedes sicut in priore.

Sexus differentia me fugit.

12. B. formiceti. *Elongata rufa, valde pubescens, thorace rotundato 3-foveato, fovea intermedia majore, elytris parce distinctius punctulatis, antennis* 10-*articulatis.* Long. .04.

Specimen unicum in Pennsylvania, cum Formica pennsylvanica, Aprilo inveni. Statura præcedentis, at minor, abdomineque paulo breviore. Antennæ articulis 3 – 8 æqualibus, 9 crassiore, transverso, 10 præced. 3 æquali, fere rotundato, apice subacuto. Thorax fovea intermedia majore. Elytra parce distinctius punctulata, stria dorsali tenui, fere integra.

Eupsenius.

Antennæ clavatæ, distantes, ad marginem frontis anteriorem lateraliter sitæ.

Palpi maxillares breviusculi, articulo ultimo ovali.

(Mentum basi angustatum ?)

Abdomen marginatum, 5-articulatum, art. 1mo *majore.*

Tarsi unguiculo unico, articulis 2 *et* 3 *æqualibus.*

Habitus fere Bryaxis, a qua differt antenni svalde clavatis, longius ante oculos, ad frontis ipsam marginem, sicut in Rhexio insertis. Ab Euplectis differt abdominis articulo 1mo majore, habitu minus elongato, abdomineque articulo 6to nullo. Mentum an quadratum, an basi angustatum, propter specimen exiguum mihi haud satis constat. Pedes minus elongati, femoribus valde clavatis. Palpi breviusculi, articulo ultimo reliquis conjunctis fere æquali, ovali.

Nomen a ευ et ψηνὸς, *rasus.*

1. E. glaber. *Lævissimus, flavicans, capite bifoveato,*

thorace linea basali arcuata, elytris basi utrinque bifoveatis. Long. .04.

Specimen unicum ad Columbiam (S. C.) a D. Zimmermani inventum.

Corpus lævissimum, glaberrimum, flavescens, nitidum. Caput inter oculos foveis 2 magnis impressum. Antennæ capite thoraceque breviores, articulis 3–8 minutis, 9 et 10 valde transversis, cum ultimo clavam ovalem apice subacutam formante, quæ longitudine funiculum æquat. Thorax capite vix latior, subcordatus, ante medium latior, basi truncatus, utrinque in ipso latere foveatus, alteraque minore ad medium, his linea profunda arcuata conjunctis. Elytra thorace sesqui latiora, convexa, sutura subtilissime marginata, basi utrinque profundius bifoveata. Abdomen elytris brevius, basi depressiusculum, versus apicem vero deflexum, anguste marginatum, articulo 1mo reliquis conjunctis fere æquali.

Arthmius.

Antennæ basi subapproximatæ, in fossula ad frontis marginem inserta.

Palpi maxillares 4-articulatæ, articulo 3^{tio} *parvo,* 4to *elongato, fusiformi.*

Mentum basi angustatum.

Abdomen immarginatum.

Tarsi unguiculo singulo.

Batriso, propter abdomen immarginatum proximum videtur hoc genus, discedit autem antennis minus distantibus, frontis margine ad insertionem paulo emarginato (in Batriso recte continuato.) Thorax globosus, estriatus, habitum peculiarem Batriso alienum, Bryaxi multo similiorem præbet. Bythino quoque aliquantulum spectat.

Nomen ab ἄρθμιος, *confederatus.*

1. A. globicollis. *Rufus nitidus, impunctatus, occipite bifoveato, thorace globoso, linea arcuata basali insculpta,*

elytris stria brevissima parum distincta, tibiis anticis compsessis, extus ad medium unidentatus. Long. .06.

Habitat in Georgia et Pennsylvania, D. D. Zimmermann et Ziegler.

Modice elongatus, convexus, rufus nitidus, parum pubescens. Antennæ longiusculæ, articulis 2–4 sensim paulo brevioribus, 5, 6, 7 æqualibus longioribus, paulo oblongis, 8–10 sensim paulo crassioribus, rotundatis, ultimo ovato, apice acuto, præcedentibus tribus longitudine fere æquali. Caput subtriangulare, oculis mediocribus prominulis, occipite bifoveato, fronte mox pone antennas utrinque leviter impresso. Thorax capite non major globosus, linea arcuata basali profunda, utrinque in fovea parva desinente insculptus. Elytra convexa, stria dorsali brevissima fere nulla. Abdomen convexum, articulo 1mo reliquis conjunctis æquali, seq. penult, inferiore profunde excavato.

Tibiæ anticæ medio dentatæ.

Mas antennarum articulo 5to præcedentibus crassiore.

Batrisus Aubé.

Antennæ basi distantes, in fossula laterali, sub frontis margine rectæ insertæ.

Palpi maxillares 4-articulati, articulo 4to fusiformi.

Tarsi articulis 2 et 3 æqualibus, hoc unguiculis binis inæqualibus.

Abdomen immarginatum.

Vide Aubé, An. Ent. Fr. l. c. sup.

Genus specierum locuples, et propter sexus differentias peculiares enodari admodum difficile. Secundum ordinem naturalem dispositæ, species in turmas subtus enumeratas sejungi videntur. Quo melius specierum differentias intelligas, diagnosin brevem ad speciem quamque Americanam adjici, ita ut tabula quasi synoptica efformatur.

A. Tibiis posticis calcare obsoleto vel nullo.

1. Fronte postice concava, vertice non cristato: ♂ antennarum articulo ultimo dentato solum cognoscendus.

1. ♂ ♀ *Ionæ*. Capite læviusculo vertice valde elevato, thorace 3-lineato.
(Hic ponendi, sunt B. formicarius, Germari, Dregei, et venustus.)

2. Fronte postice concava, vertice cristato, fossulis lateralibus permagnis; ♂ tibiis anticis contortis spiniferis.

2. ♂ *Armiger*. Vertice 3-cristato, antennarum art. ult. longissimo, tarsis posticis articulo 1mo dilatato.
3. ♂ *Monstrosus*. Vertice 3-cristato, antennarum art. ult. longiusculo, tarsis posticis simplicibus.
4. ♂ ♀ *Ferox*. Vertice 3-cristato, antennarum art. ult. ovali, impress. capitis confluentibus.
5. ♀ *Cristatus*. Vertice 3-cristato, antennarum art. ult. ovali, impress. capitis discretis.
6. ♀ *Confinis*. Vertice 1-cristato, antennarum art. ult. ovali, imp. capitis conjunctis.
Ad hanc turmam forte referendus B. australis Er.

B. Tibiis posticis calcare terminali longo, tenui.

3. Fronte inter antennas, plus minusve elevata, retusa vel marginata, clypeo apice sæpius ♂ dentato, vel cornuto.

7. ♂ *Frontalis*. Capite lævi, fronte valde retuso, rufus, elytris impunctatis.
8. ♂ ♀ *Punctatus*. Capite lævi, vertice tuberculato, rufus elytris punctatis.
9. ♂ ♀ *Riparius*. Capite leviter scabro, vertice cristato, lævi, rufus, elytris punctatis.
10. ♂ ♀ *Scabriceps*. Capite scabro, castaneus, elytris punctatis, antennis gracilibus.
11. ♂ *Nigricans*. Capite lævi, thorace 3-lineato, niger, elytris impunctatis.
(Hic interponendus B. oculatus Europæ.)
12. ♂ ♀ *Striatus*. Capite lævi, thorace 3 lineato, elytris obsolete punctulatis.
(Forte hic advenit B. Delaporti Europæ.)
13. ♂ ♀ *Globosus*. Capite scabro, vertice lævi, thorace 3-lineato, elytris impunctatis.
14. ♂ ♀ *Spretus*. Capite lævi, thoracis linea media obsoleta, niger elytris impunctatis.

4. Fronte plana, minime retusa.

15. ♂ *Bistriatus*. Capite scabro, vertice lævi, thoracis linea media obsoleta.
16. ♂ ♀ *Lineaticollis*. Capite scabro, thorace 3-lineato.
In hac turma, verisimiliter ponendus B. albionicus Californiæ.

Observations. I am not quite certain that I have intercalated the foreign species in the proper place; as the characters which I have chosen to define the groups appear not to have been regarded before. Even so important a mark as the terminal spur of the posterior tibiæ has been mentioned by Aubé in only a single instance, (B. oculatus,) although from his having omitted it in B. lineaticollis and Schaumii, in which it is very obvious, we may easily imagine that it has been overlooked in other species. The sexual characters of B. Delaporti are so very similar to those of several species of my third group, that I think it most probably belongs where I have placed it.

A few words on the great number of species which I have ventured to establish: In the second group it may appear that I have increased the species without suffi-

cient grounds, considering that there still remain four species of which we know only one sex. I have found that in this genus, the most closely allied species possessed similar sexual characters; therefore, observing that in the two sexes of *B. ferox* there was no difference in the structure of the head and antennæ, I concluded that the two females (5 and 6) were each different from the two males, (2 and 3.) The other three species, of which one sex is deficient, will be admitted without difficulty, as in each instance the individual described has been a male.

In the Northern States an individual of this genus is scarcely ever seen apart from a colony of ants, but in the South, they are quite frequently found under the bark of trees, where no ants are to be seen. The northern species, as far as my experience goes, are found only under stones; the southern ones, (except *B. Ionæ* and a few specimens flying in twilight,) occurred under bark.

A. 1.

1. B. Ionæ. *Rufus, capite læviusculo, vertice tuberculato, thorace 3-lineato, antennis crassiusculis.* Long. .10.

Specimina duo ad montis Ionæ Georgiæ apicem cum formica parva nigra, opaca, pedibus antennisque rufo-piceis, Maio inveni.

Rufus pubescens. Caput ad latera vix conspicue scabrum, vertice valde elevato, obsolete foveato convexo, sulco semicirculari lato profundo definito. Antennæ crassiusculæ, articulis 2–8 æqualibus, 9 et 10 sensim parum majoribus, 11 longiore crassiore, ovali, apice acuto. Thorax sub campanulatus, lateribus rotundatus, fortiter 3-lineatus tuberculo utrinque parvo acuto versus basin. Elytra parce vix punctulata, humeris truncatis, angulo obtuso, stria dorsali ante medium abbreviata. Pedes valde elongati, tibiis posticis calcari brevissimo, vix cernendo.

Mas articulo antennarum ultimo intus ad basin dentato, præced. 3 longitudine æquante. Femina, antennarum art. 8vo paulo minore, 9 et 10 sesqui crassioribus æqualibus, 11mo præced. 2 æquante, basi rotundato.

A. 2.

2. B. armiger. *Rufus, capite scabriusculo, vertice elevato, 3-cristato, sulco lato circumcincto, antennarum articulo* 10mo *globoso, ultimo longissimo.* Long. .09.

Habitat in Pennsylvania cum formica media rufa.

Rufus, parce pubescens. Caput magnum, leviter scabrum, lateribus postice acutis, vertice elevato, 3-cristato, sulco cir-

cumducto, utrinque late foveatum, fronte valde excavata. Antennæ capite thoraceque longiores, art. 2 – 9 sensim parum brevioribus, 10 majore globoso, 11 præcedentes 5 æquante, basi oblique truncato, apice depresso, acuto, præcedente vix crassiore. Thorax subcampanulatus, lateribus ad medium spinosis, fortiter 3-lineatus, interstitio utroque seriatim 3-spinoso; (spinis 2 ante medium acutis, reflexis.) Elytra impunctata, humeris truncatis, angulo obtuso, stria ad medium abbreviata. Tarsi postici articulo 2ndo tumido. (An nota sexualis?)

Mas tibiis anticis medio contortis, dente longo acuto ad medium, alteroque prope basin parvo armatis, femoribus intermediis superne subito emarginatis, tibiis calcare interno terminali; antennarum art. ultimo basi subtus oblique producto.

Femina latet.

3. B. monstrosus. *Rufus, capite lævi vertice elevato 3-cristato, sulco lato circumcincto, antennarum articnlis* 9 *et* 10 *majusculis, globosis.* Long. .09.

Specimen unicum ad Athenas Georgiæ, sub cortice inventum.

Statura et summa affinitas præcedentis, capite lævi, antennarum articulo 9no præced. duplo majore, 10mo fere æquali, globosis: ultimo ovali basi oblique truncato, apice depresso præced. 3 longitudine æquali; tarsisque posticis simplicibus differt.

Mas notis iisdem cognoscendus, licet dente tibiarum anticarum lato, breviore distinctus.

4. B. Ferox. *Rufus, capite lævi, vertice elevato, 3-cristato, sulco lato circumcincto, antennis gracilibus, articulo ultimo ovalis.* Long. .09.

Habitat in Pennsylvania et Ohio, cum formicis variis.

Statura omnino præcedentium, at fronte profundius latius excavato, thorace minus profunde lineato ad latera vix spinoso, spinulis discoidalibus 4 primis minutis, antennisque gracilibus, articulis 8 – 10 sensim paulo crassioribus, 11mo

duplo longiore, ovali, crassiore, apice acuto. Elytra parce subtiliter, punctata. Tarsi postici simplices.

Mas notis sicut in B. monstroso, at tibiarum anticarum spina superna nulla, inferna lata, brevi; antennis art. 11mo dente vix conspicuo interno ante basin, 10mo vero superne paulo sinuato.

Femina, tibiis anticis pedibusque intermediis simplicibus.

5. B. cristatus. *Rufus, capite discrete 3-impresso, vertice elevato 3-cristato, thorace obsolete lineato, articulo antennarum ultimo ovali.* Long. . .

Specimen unicum in Pennsylvania, cum form. magna rufa, capite obscuriore, D. Haldeman.

Statura et forma omnino præcedentis, at capite aliter impresso, thoraceque spinulis nullis anterioribus differt.

Rufus, pubescens. Caput antice late excavatum, super oculos late foveatum, vertice elevato, 3-cristato. Antennæ sicut in præcedente, articulo 10mo tamen paulo transverso. Thorax subcampanulatus, lateribus rotundatus, obsolete lineatus, versus basin fortius bispinosus. Elytra humeris oblique truncatis, angulo prominulo, stria dorsali brevissima minus distincta.

Mas latet.

6. B. confinis. *Rufus, capite lævi, vertice elevato, 1-cristato, sulco circumcincto, thorace obsolete lineato, antennis gracilibus, articulo ultimo ovali.* Long. .08.

Specimen unicum femineum ad Athenas Georgiæ Maio inveni.

Statura præcedentis, vertice 1-cristato, sulco circumcincto, thoracis spinis subbasalibus minoribus differt. Antennæ adhuc magis graciles, articulis 9–10 vix crassioribus, at non brevioribus, 11mo sesqui crassiore duploque longiore ovali, acuto.

B. 3.

7. B. frontalis. *Rufus, capite lævi, fronte valde retusa, vertice elevato, sulco profundo circumcincto, thorace 3-lineato, elytris impunctatis.* Long. .09.

Specimen unicum masculinum a Pennsylvania, D. Haldeman.

Statura præcedentium, sed propter tibias posticas calcaratas in turma hacce ponendus.

Rufus parce pubescens. Caput magnum, fronte extenso, transversim elevato, valdeque retuso, clypeo ad apicem cornu horizontali armato, vertice modice elevato, convexo, sulco profundo lato circumcincto. Antennæ elongatæ art. 3–8 sensim parum brevioribus, 9–10 paulo crassioribus, 11mo majore ovali acuto, subtus ad medium vix conspicue inciso, dentatoque (nota sexualis). Thorax latitudine non longior, campanulatus, lateribus valde rotundatus, fortiter 3-lineatus, ante basin tuberculis 2 parvis subacutis. Elytra impunctata, humeris truncatis, stria dorsali profunda, fere ad medium extensa.

8. B. punctatus. *Rufus, capite lævi, vertice elevato, sulco profundo circumcincto thorace 3-lineato, elytris punctatis.* Long. .08.

Habitat in Georgia; Athenas, Nakutshique ad montes.

Rufus, parum pubescens. Caput læve, fronte super antennas utrinque elevata, vertice elevato, convexo, sulco profundo ambiente. Antennæ elongatæ, graciles, art. 2^{ndo} crassiore, at sequentibus non breviore, 3–8 æqualibus, 9 et 10 vix crassioribus, ultimo sesqui crassiore, triplo longiore, ovato, acuto. Thorax subpentagonus, lateribus fere angulatus, fortiter 3-lineatus, disco utrinque pone medium carinatus, ante basin dente distincto armatus. Elytra sat grosse punctata humeris vix truncatis, stria dorsali valde abbreviata.

Mas, antennarum articulo ultimo subtus ad basin dente valde distincto.

9. B. riparius. *Rufus, capite leviter scabro, vertice cristato lævi, sulculo ambiente, thorace 3-lineato, elytris punctatis.* Long. .07.

Aubé, An. Ent. Fr. l. c. 83.

Say, I. Ac. Nat. Sc. 4, 98.

Habitat in Georgia, sub cortice pinuum sat frequens; in Pennsylvania cum Form. pennsylvanica, sub lapidibus rarius.

Rufus, parce pubescens. Caput leviter reticulato-punctatum, fronte inter antennas paulo concava, antice subacute leviter retusa: vertice modice elevato, lævi, tenue cristato, sulco angusto ambiente, postice in fovea utrinque profunda desinente. Antenna articulis 3 – 8 æqualibus crassitie haud longioribus, 9 – 10 paulo majoribus, 11mo ovali, acuto. Thorax longiusculus, lateribus medio rotandatus, 3-lineatus, *utrinque obsolete carinatus, ante basin distinctius* bidentatus. Elytra punctata humeris parum truncatis, stria dorsali brevissima.

Mas, antennarum articulo 10mo majore globoso, ultimo non crassiore elongato, sinuato, infra ad basin dente distincto armato.

Femina antennarum articulo 10mo præcedente paulo majore, ultimo sesqui crassiore, ovali, acuto.

In structura maris antennarum omnino cum Beati Sayi descriptione quadrat hæc species: puncturam elytrorum autem, licet distinctam memorat nec ille, nec Ill. Dom. Aubé. Forsitan species distincta mihi ignota ab auctoribus citatis indicatur.

10. B. scabriceps. *Cinnamomeus, capite scabro, vertice parum elevato, vix cristato, sulco tenui ambiente, thorace 3-lineato, elytris punctatis.* Long. .07.

Habitat Nov. Aureliani; a Dom. Schaum sub nomine Schaumii benevole datus.

Cinnamomeus, pubescens. Caput scabrum, fronte mox ante antennas rotundato, marginatum, retusam, vertice parum elevato, obsolete cristato, sulculo minus profundo ambiente postice in fovea utrinque occipitali desinente. Antennæ longiusculæ, tenues, art. 3 – 8 latitudine paulo longioribus, 9 – 10 sensim paulo crassioribus, ultimo ovato, acuto. Thorax lateribus subangulatus, fortiter 3-lineatus utrinque sub-carinatus, ante basin fortiter bispinosus. Elytra parce subtilius punctata, humeris truncatis, stria dorsali brevi profunda.

Mas, antennarum articulo 10mo majore, ultimo non crassiore, basi vix dentato, frontis apice ipsa excavata.

Femina, antennis paulo brevioribus, art. 10mo præced. crassiore ovali, frontis apice simplici.

Obs. Descriptioni Aubeanæ (An. Ent. l. c. 84,) minime convenit. Potius cum B. punctato meo (supra) quadrat species Aubeana, discedit autem capite reticulato.

11. B. nigricans. *Niger, capite fere læve, vertice leviter cristato, sulco lato ambiente, thorace 3-lineato, elytris impunctatis.* Long. .08.

Specimen unicum masculinum ad Columbiam Car. Australis inveni.

Niger, nitidus parum pubescens. Caput trigonum, postice truncatum, læve, lateribus acute carinatis, fronte leviter punctata, in ipso apice breviter bidentato retusoque, vertice leviter elevato, subtiliter cristato, sulco profundo ambiente. Antennæ articulo 3^{tio} crassiusculo, 4 – 8 æqualibus, crassitie haud longioribus, 9 paulo majore, 10 fere duplo crassiore globoso, ultimo sesqui longiore ovali, acuto. Thorax longiusculus, lateribus medio rotundatus, 3-lineatus, ante basin utrinque spinula parva armatus. Elytra impunctata, humeris paulo truncatis, stria dorsali ante medium abbreviata.

B. oculato Europæ (Aubé, l. c. 85) affinis videtur.

12. B. striatus. *Piceus, capite leviter scabro, vertice lævi, elevato, cristato, sulco ambiente, thorace 3-lineato, lateribus subangulato, elytris sanguineis, obsolete punctulatis.* Long. .07.

Habitat in Pennsylvania.

B. riparii feminam maxime refert, at capitis sulcis paulo profundioribus, antennarum articulo ultimo breviore thorace paulo minus elongato, punctis elytrorum minus distinctis, coloreque obscuro distinguendus.

Piceus, pubescens. Caput punctatum, fronte transversim paulo elevata, vertice lævi, modice elevato, crtistatoque, sulco ambiente, postice utrinque in fovea majuscula desinente. Antennæ testaceæ art. 2 – 8 æqualibus, crassitie haud longiori-

bus, 9, 10 sensim majoribus, rotundati, ultimo sesqui longiore crassiore ovali acuto. Thorax latitudine non longior, subpentagonus, lateribus fere acute rotundatus, fortiter 3-lineatus, utrinque subcarinatus, ante basin dentibus 2 minutis armatus. Elytra sanguinea obsolete parce punctulata, humeris truncatis, stria dorsali ante medium abbreviata.

13. B. globosus. *Obscurus, capite scabro vertice lævi, cristato, sulco ambiente, thorace 3-lineato lateribus rotundato, elytris sanguineis, obsolete punctulatis.* Long. .07.

Habitat in Pennsylvania et Georgia, cum formicis variis.

Femina præcedentem valde refert, et præter antennarum art. 9no præcedente non majore, thoraceque lateribus minus subito angulato non differt.

Obscure rufus, modice pubescens. Caput antice scabrum, vertice lævi, modice elevato, leviterque cristato, sulco ambiente, postice in fovea utrinque desinente. Antennæ breviusculæ, art. 2 – 9 æqualibus, 10 majore rotundato, ultimo paulo longiore, (in femina crassiore,) ovali acuto. Thorax latitudine non longior, lateribus valde rotundatus, 3-lineatus, interstitio breviter obsolete carinato, ante basin spicula parva armato. Elytra sanguinea obsolete parce punctulata, humeris truncatis, stria dorsali fere ad medium extensa. Variat totus rufus.

Mas antennarum art. 10mo maximo, globoso, ultimo non crassiore, basi non dentato, fronte valde retuso, clypeo ad apicem acute tridentato, dente intermedia longiore, tibiis intermediis spinula parva apicali.

Femina, antennarum art. 10mo præced. sesqui crassiore, clypeo apice simplici, fronte minus retuso, transversim paulo elevato.

14. B. spretus. *Niger, capite læviusculo vertice non cristato, sulco ambiente, thorace bilineato, elytris impunctatis, antennis pedibusque testaceis.* Long. .06 – .07.

Habitat ad vallem Nakutshi, Georgiæ: et in Vermont, Dom. C. B. Adams.

Statura præcedentis, niger paulo pubescens. Caput fere

læve, fronte inter antennas transversim elevata, leviterque retusa (multo magis in mare): vertice modice elevato, striola profunda ambiente, postice in fovea utrinque profunda desinente. Antennæ testaceæ, articuls 2–8 æqualibus, crassitie non longioribus, 9 paulo crassiore, fere transverso, 10mo majore rotundato, 11mo longiore, 2 præced. æquali (in femina crassiore) ovato, acuto. Thorax latitudine fere longior, lateribus rotundatus, striis solitis fere nullis, linea autem postica, foveis profundis; versus basin spicula minuta utrinque armatus. Elytra impunctata, stria dorsali ante medium abbreviata. Pedes testacei.

Mas, fronte magis retuso, (clypeo apice autem inarmato,) antennarum articulo 10mo magno globoso, ultimo non crassiore, basi edentato.

B. 4.

15. B. bistriatus. *Castaneus, capite scabro, occipite bifoveato, vertice fere lævi, vix elevato, thorace bilineato, elytris parce subtiliter punctatis.* Long. .08.

Specimen unicum masculinum, in Pennsylvania, cum formica magna rufa, lectum. D. Haldeman.

Castaneus, parum pubescens. Caput scabrum, fronte lata fere plana, vertice vix elevato sublævi utrinque foveato, sulco solito vix distincto. Antennæ articulis 2–9 subæqualibus, crassitie haud longioribus, 10mo duplo majore, globoso ultimo sesqui longiore, ovali, acuto, non dentato. Thorax longiusculus, lateribus rotundatus, foveis basalibus distinctis, lineis autem parum profundis, media obliterata antice spinulis 2 minutissimis armatus. Elytra humeris vix truncatis, parce subtiliter punctata, stria dorsali brevi profunda. Abdomen obscurum. Tibiæ intermediæ spinula minuta apicali.

B. albionico (Aubé) proximus videtur, differt tamen capite scabro, verticeque non impresso.

16. B. lineaticollis. *Castaneus, capite scabro, occipite bifoveato, vertice vix elevato, thorace 3-lineato, elytris impunctatis.* Long. .08.

Aubé, Mon. Ps. 50, tab. 90, fig. 3 : An. Ent. Fr. l. c. 83.
Habitat cum formica magna rufa. Pennsylvania, Georgia.

Castaneus, parum pubescens. Caput scabrum, fronte lata plana, vertice vix elevato, leviter cristato, utrinque foveato, sulco solito obsoleto. Antennæ articulis 3–9 subæqualibus, 10 crassiore, ultimo fere duplo longiore (in fem. crassiore) ovali, acuto. Thorax latitudine non longior, lateribus acute rotundatus, 3-lineatus, utrinque distinctius carinatus, ante basin spinulis 2-armatus: parce obsolete punctulatus. Elytra humeris paulo truncatis, impunctata, stria dorsali ante medium obliterata. Abdomen obscurum.

Mas, antemarum articulo 10mo magno globoso, ultimo non crassiore, edentato: tibiis intermediis calcare terminali brevi.

Species mihi ignotæ.

17. B. albionicus. "*Elongatus, nigro piceus capite majusculo, leviusculo, vertice tuberculato, tuberculo levi (lævi?) in summo fossula punctiformi impresso, thorace bisulcato.* Long. $2\frac{1}{3}$ mill."

Aubé, Mon. Psel. 49. tab. 90, 2.
An. Ent. Fr. l. c. 83.
Man. Trans. Mosc. 1843.
Habitat in California.

18. B. Schaumii. "*Elongatus, cinnamomeus, capite reticulato, vertice tuberculato, tuberculo leviter elevato, fossula punctiformi vix impresso; antennis gracilioribus, thorace 3-sulcato, elytris conspicue punctatis.* Long. $2\frac{1}{4}$ mill."
Aubé, An. Ent. Fr. l. c. 84.
B. punctato proximus videtur.

Rhexius.

Antennæ distantes, ad frontis marginem insertæ, geniculatæ, clavatæ.

Palpi maxillares breves articulo ultimo ovato, acuto.

Abdomen subtiliter marginatum, articulis subæqualibus.

Tarsi unguiculo singulo.

Corpus subelongatum, convexum, valde pubescens, elytris parallelis, thorace vix sesqui latioribus. Caput breve pentagonum, basi truncatum; labrum apice rotundatum. Antennæ ad frontis marginem insertæ, basi distantes, breviusculæ, fractæ, articulo 1mo elongato, 2^{ndo} crassitie 1mo æquali, 3–8 minutis, transversis, approximatis, conjunctis 1mo breviore, 9–10 crassioribus transversis, ultimo magno fere globoso inferne tamen oblique subtruncato. Palpi maxillares per-breves, articulo penultimo transverso, ultimo ovato acuto, præcedentibus conjunctis æquali. Mentum parvum subemarginatum. Abdomen convexum, margine acuto, vix reflexo, articulis 1 et 2 subæqualibus: pedes mediocres, trochanteribus anterioribus prominulis, obtusis, tarsorum articulis 2 et 3 æqualibus.

Genus propter antennas fractas singulare, et a ῥήσσω, frango, dicatum.

1. R. insculptus. *Rufus, nitidus pubescens, fronte* 3 *foveolata, occipite excavato, thorace canaliculato, utrinque postice foveato, poneque medium breviter transversim impresso, elytris basi bifoveatis.* Long. 06.

Habitat Nov. Aureliani, a D. Schaum amice missus.

Rufo-testaceus, nitidus, valde pubescens. Caput transversum, ad frontem obsolete canaliculatum, 3-foveatumque, occipite mox ante collum profunde excavato, basi truncatum, angulis posticis rectis. Thorax transversus, capiti æqualis, basi paulo angustiore, truncatus lateribus angulatus, antice attenuatus, capiti collo brevi tenui conjunctus; utrinque versus basin fovea magna insculptus: canaliculatus, sulculo postico brevi transversim impressus. Elytra humeris rectis, parum rotundatis, basi elevato-marginata, utrinque bifoveata, stria dorsali nulla: abdomen elytris æquale, apice obtuse rotundata. Sexus differentia latet.

Euplectus Leach.

Antennæ 11-*articulatæ, distantes, sub margine frontali insertæ rectæ.*

Palpi maxillares mediocres, articulo ultimo ovali, acuto.

Mentum subquadratum.

Abdomen 6-articulatum, marginatum, articulo 5to *supra indistincto,*[1] 4 *primis æqualibus.*

Tarsi unguiculo unico longiusculo.

Genus habitus variabilis; species aliæ elongatæ lineares, fere depressæ, (A) Staphylinos simulant, et optime ad oxytelos transitionem faciunt. Aliæ autem (B) Pselaphos genuinos, præcipue Batrisos revocant. Genus Aubeanum Trimium, licet habitu speciebus typicis convexione, articuloque antennarum ultimo maximo primo intuitu differre videtur, accuratius inspectum, non satis distinctum apparet; et cum speciebus subtus descriptis, seriem faciat, in qua formas quasi hybridas inter Euplectum et Trimium facile invenies.

Secundum corporis formam, thoracisque sculpturam, divisiones sequentes distinxi:—.

A. Corpus elongatum, elytris depressis, antennarum articulis penultimis crassioribus.

a. Thorax canaliculatus, vel medio foveatus.

1. *Linearis.* Canalicula integra, medio dilatata, capite lævi.
2. *Confluens.* Canalicula integra, medio dilatata, capite thoraceque punctulatis.
3. *Interruptus.* Thorace fovea elongata capite lævi, vertice elevato.
4. *Difficile.* Thorace fovea elongata, capite lævi, vertice elevato, foveatoque.
5. *Pumilus.* Thorace fovea elongata, capite punctulato.

b. Thorax medio non canaliculatus.

6. *Arcuatus.* Capite antice arcuatim impresso, postice utrinque foveato.

B. Corpus convexiusculum.

a. Thorax subtiliter canaliculatus; antennæ articulis 9–10 crassioribus.

7. *Canaliculatus.* Capite utrinque bi-impresso, elytris confertim punctatis.

b. Thorax non canaliculatus, foveis posticis linea conjunctis, antennarum articulo 11mo maximo, globoso. TRIMIUM Aubé.

8. *Globifer.* Capite arcuatim impresso, elytris stria dorsali brevi.
9. *Dubius.* Capite punctato, angulatim impresso, elytris stria dorsali.
10. *Parvulus.* Capite lævi minus profunde impresso, postice bifoveato.

A.—a.

1. E. linearis. *Testaceus, pubescens, capite sulcis profundis antice conjunctis, vertice foveato, thorace canaliculato, foveisque posticis sulco connexis.* Long. .06.

[1] The 5th and 6th dorsal segments are very closely articulated, so that the suture is only rarely to be seen; but the six ventral segments in both divisions of the genus can almost always be distinguished without difficulty.

Habitat in provinciis australibus. Louisiana (Schaum,) Georgia.

Elongatus, linearis, rufo-testaceus, nitidus pubescens. Caput marginibus elevatis, sulcis profundis antice conjunctis insculptum, vertice elevato, fovea parva impresso. Antennæ articulis 2–9 gradatim vix crassioribus, 10 transverso ultimo, plus duplo majore, apice obtuso. Thorax latitudine non brevior postice modice angustatus, foveis 3 pone medium magnis sulco transverso conjunctis, disco usque ad foveam profunde canaliculatus. Elytra basi marginata, parce obsolete punctata, stria dorsali ad medium abbreviata. Abdomen articulis 2 primis basi impressis.

2. E. confluens. *Testaceus, pubescens, capite thoraceque punctulatis, illo striis parallelis, antice transversim conjunctis, hoc a medio postice canaliculato, foveis posticis sulculo vix conjunctis.* Long. 06.

Specimen unicum ad Cambridge (Mass.) Maio sub cortice inveni.

Statura priore paulo depressior linearis testaceus. Caput punctatum, sulcis 2 profundis parallelis, sulculo transverso, antice connexis, vertice parum elevato, lævi, foveola minima basali notato. Antennis articulis 3–8 subæqualibus, 9 et 10 transversis, ultimo majore rotundato. Thorax subtiliter punctulatus, foveis 3 magnis pone medium sulco obsoleto conjunctis, disco fovea magna oblonga cum fovea postica confluente impresso. Elytra basi marginata, impunctata, stria dorsali tenui ad medium abbreviata. Abdomen articulis 2 primis basi vix conspicue impressis.

3. E. interruptus. *Testaceus, pubescens, capite sulcis profundis, antice conjunctis, vertice elevato, thorace foveis 3 posticis sulco conjunctis, alteraque ad medium oblonga discreta.* Long. .06.

Habitat ad Athenas Georgiæ. Specimina duo Maio lecta.

Statura E. linearis at paulo majore. Caput idem, vertice autem non foveato. Antennæ articulis 3–8, æqualibus 9–11,

gradatim crassioribus, 9 et 10 transversis, 11 majore rotundato. Thorax, latitudine vix brevior, foveis 3 magnis pone medium sulco conjunctis, alteraque discoidali oblonga, cum postica non confluente. Elytra basi marginata impunctata, stria dorsali ad medium extendente. Abdomen articulis 2 primis basi impressis.

4. E. difficilis. *Testaceus, parum pubescens, capite sulcis 2 obliquis, antice transversim impresso, vertice elevato foveatoque, thorace fovea mediali discreta, posticis sulco conjunctis.* Long. .05.

Habitat ad Athenas Georgiæ. Specimen unicum vidi.

Præcedenti paulo angustior, paulo minus pubescens. Caput foveis posticis majoribus, sulcis obliquis minus profundis, fronte transversim impressa, vertice elevato foveatoque. Antennæ, sicut in E. interrupto. Thorax latitudine vix longior, fovea magna oblonga ad medium, cum postica fere confluente, foveis posticis 3 sulco conjunctis. Elytra impunctata basi marginata, stria dorsali brevi, tenui. Abdomen basi vix impressum.

5. E. pumilus. *Testaceus, pubescens, capite punctulato, sulcis antice conjunctis minus profundis, vertice foveato, thorace foveis posticis sulco conjunctis, alteraque magna discoidali fere confluente.* Long. .02.

Specimen unicum ad Charleston (S. C.) inveni.

Minutus, fere linearis. Caput punctulatum, fronte marginata, sulcis solitis minus profundis, antice angulatim conjunctis, vertice modice elevato foveatoque. Antennæ sicut in præcedente. Thorax latitudine non longior postice minus angustatus, foveis 3 posticis sulco transverso conjunctis, alteraque discoidali magna cum postica fere confluente. Elytra thorace paulo latiora, obsolete punctata basi marginata, stria dorsali ad medium extensa. Abdomen basi non impressum.

A.—b.

6. E. arcuatus. *Testaceus, parum pubescens, capite profunde arcuatim impresso, vertice convexo, thorace foveis sulco conjunctis.* Long. .04.

Ad Athenas Georgiæ specimina duo inveni.

Elongatus, at minus depressus, testaceus paulo pubescens. Caput impressione arcuata profunda, postice in fovea utrinque desinente; vertice elevato. Antennæ articulis 3–8, æqualibus 9–10 transversis, hoc majore, 11 majore ovali, apice obtuso. Thorax latitudine non longior, foveis 3 posticis sulco profundo connexis. Elytra thorace vix latiora impunctata, stria dorsali profunda, fere ad medium extensa. Abdomen basi haud impressum.

B. — a.

7. E. canaliculatus. *Testaceus, pubescens, fronte transversim impressa, vertice elevato, foveatoque, thorace elytris punctulatis, illo subtiliter canaliculato, foveis 2 posticis sulculo conjunctis,* Long. .04.

Habitat Columbiæ (S. C.) et ad Athenas Georgiæ.

Elongatus, convexiusculus, testaceus, pubescens. Caput fronte transversim impresso, postice utrinque foveatum, vertice elevato, foveatoque. Antennæ ♂ articulis 3–8 æqualibus 9–10 crassioribus transversis, ultimo longiore majore apice fere oblique truncata, subacuta. Thorax latitudine non brevior, postice magis angustatus, lateribus fere angulatus, subtilissime punctulatus, subtiliter canaliculatus, foveis 2 posticis sulculo conjunctis. Elytra thorace vix latiora, subtilissime punctulata, stria dorsali fere nulla. Abdomen basi haud impressum.

B. — b.

8. E. globifer. *Pallide testaceus, pubescens, capite arcuatim impresso, thorace foveis sulco angulato conjunctis, elytris stria dorsali, palporum articulo ultimo ovali.* Long. .06.

Specimen unicum ad vallem Nakutshi Georgiæ inventum.

Pallide testaceus, sat pubescens. Caput impunctatum, profunde arcuatim impressum. Antennæ articulis penultimis vix transversis, ultimo magno ovali, subacuto. Palpi articulo ultimo fusiformi. Thorax latitudine non longior, postice angustatus, lateribus rotundatus, foveis 2 magnis sulco profundo

angulato conjunctis. Elytra thorace latiora et longiora, stria basali profunda. Abdomen modice elongatum, haud impressum.

9. E. dubius. *Testaceus, parum pubescens, capite punctato, angulatim impresso, thorace foveis sulco fere recto conjunctis elytris basi foveatis, palporum articulo ultimo securiformi.* Long. .03.

Habitat cum priore.

Præcedente longior, et multo minor, testaceus, minus pubescens. Caput punctatum, minus profunde angulatim impressum, vertice vix foveato. Antennæ articulo ultimo maximo, apice rotundato. Palpi articulo ultimo securiformi. Thorax latitudine longior, foveis posticis sulco vix angulato conjunctis. Elytra thorace latiora, convexa, basi utrinque bifoveata. Abdomen modice elongatum, haud impressum.

10. E. parvulus. *Testaceus, pubescens. Capite profundius angulatim impresso, thorace foveis sulco fere recto conjunctis, elytris basi foveatis, palporum articulo ultimo securiformi.* Long. .03.

Specimen unicum Charlestoniæ, Carolinæ Australis, inveni. Statura omnino præcedentis, cui tamen differt capite impunctato, profundius impresso, elytrisque minus convexis.

Faronus, Aubé.

Antennæ basi distantes, moniliformes, gradatim incrassatæ.
Palpi maxillares breviusculi, 4-articulati, articulo 4to *ovali.*
Mentum quadratum.

Abdomen late marginatum apice acutum, 6–articulatum, articulis 4 *primis æqualibus,* 6to *minuto retractili.*

Tarsi unguiculis 2 *æqualibus, articulis* 1 *et* 2 *brevibus.*

Ad genus Aubéanum, ut genera non leviter augerem, retuli insectum subtus descriptum, quod tamen notis plurimis specificis valde discrepat. Antennæ fere sicut in Euplectis insertæ sunt, sed magis distantes, et frontis margo supra insertionem tuberculum parvum format. In apice acuti abdominis artic-

ulo parvo 6to retractili, ad Staphylinos Omalinos spectare videtur. Palpi maxillares capite breviores articulo 2^{ndo} sequenti duplo longiore, hoc parvo, 4to iterum longiore, ovali.

1. E. Tolulæ. *Piceus, nitidus, capite antice foveato, thorace basi transversim excavato, elytris parce punctulatis, bistriatis, antennis pedibusque flavis.* Long. .09.

Specimen unicum ad Tolulæ cataractam Georgiæ inveni.

Corpus elongatum, elytris abdomineque depressis, Apocello sphæricolli subsimile, piceum, nitidum, pube depressa grisea parce vestitum. Caput triangulare, pone oculos subtus tuberculo minimo instructum; fronte utrinque super antennas paulo elevata, medio fovea magna oblonga impressa; vertice elevato, utrinque fovea parva. Antennæ flavæ, pilosæ, moniliformes, sensim parum incrassatæ. Thorax capite paulo latior, subglobosus, fovea parva postica utrinque in ipso latere impressus, medio ad basin profunde transversim excavatus. Elytra thorace paulo latiora, antrorsum angustata, basi recte truncata, depressa, parce punctulata striis 2 dorsalibus fere integris, interiore profundiore, sutura valde marginata. Abdomen depressum, late marginatum, apice acutum. Pedes minus elongati, flavi.

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ERRATA.

Page 66, line 5th, for "this up" read "up this investigation."
" 68, " 24th, for "many" read "some."
" 70, " 13th, for "two genera" read "two didactyle genera."
" 71, " 2nd, for "Osorus" read "Osorius."

ART. VIII.—*Dissection of Crocodilus lucius.* BY SAMUEL KNEELAND, JR., M. D. Boston.

THE animal, of whose viscera the following notes were made, was the female of the *Crocodilus lucius*, L.; it died in Boston from the effects of an accident in January, 1848, at which time the dissections were made. Its length was seven feet, from the tip of the nose to the end of the tail. In many particulars the viscera differ from the descriptions of the books.

The *heart*, which was the most carefully examined, as its structure is somewhat a matter of dispute, was found to agree very nearly with the descriptions of Meckel and Bischoff.

The *tongue*, very little raised above the floor of the mouth, was of a whitish color, 8 inches long, 3 inches wide in the

middle and 1½ at tip, and ¾ of an inch thick. It was smooth in its central portion, but somewhat rough at tip; the folds at its base were arranged in a circular contorted manner, and were very prominent.

The *hyoid bone* sent upwards a rounded cartilaginous continuation, made prominent at will in the mouth; the soft palate hung down to meet this, by which the cavity of the mouth could be completely shut off from the fauces. The nostrils opened externally at the very tip of the nose, and internally behind this curtain, so that respiration can go on when the mouth is full of water, if the end of the nose be exposed to the air.

From the base of the tongue to the cardiac orifice was two feet. The longitudinal fibres of the *œsophagus* were very distinct near the stomach, forming prominent rough folds. Just below the hyoid bone it measured, cut open, 6 inches in width; at the cardiac orifice 4½ inches.

The *stomach* was filled with half-digested food. It was nearly globular, measuring about 9 inches in all diameters. The walls were half an inch thick; the inner surface smooth, of a dull white color, without evident papillæ. It was studded with what resembled erosions, or ulcerations, most numerous on the greater curvature, opposite the cardiac orifice; they varied in diameter from one-fourth of an inch downwards, some nearly a line in depth; some of these seemed to be raised above the surface, and resembled circular patches of glands; they gave a gritty sensation to the finger in some places. The *pyloric* orifice, rough and warty, was 1½ inches from the cardiac. Between these was a *sac*, large enough to hold a goose-egg, stained by contact with the *gall bladder*; which last resembled in shape and size the finger of a glove. The pyloric orifice and the duodenum, cut open, were an inch wide; the latter very thick and suddenly turned on itself; the inner surface consisted of a loose, very movable net work.

The *intestines* were divided into the small intestine and

the colon, separated by a well-marked ileo-colic valve. From the pylorus to this valve was 12 feet only; cut open, the small intestine was an inch wide. The large intestine, from the valve to anus, was 18 inches long; cut open, 5 inches wide. Thus, the whole length of the alimentary canal was only 13½; feet, not quite twice the length of the animal.

The *kidneys* were situated very far back, in contact on the median line. Each was 7 inches long, and 3 broad in the middle; of the shape of an irregular cone, the apex forwards; color, light red; divided into many convoluted lobules. They were covered externally with innumerable small, whitish points, having the appearance and feel of grains of sand: the same appearance was noticed in the interior of the organ. The *ureters* were 5 inches long, of the size of crow-quills, opening into the cloaca; they contained the usual viscid creamy substance, the urine, which in these animals is excreted as a hard paste.

The *ovaries* were situated above the kidneys, on the median line. They were mottled externally; containing numerous transparent vesicles, and many globular bodies with firm walls filled with a creamy substance. These last varied in size from a large grape to a pea. There were also some of these globular bodies void of contents, which could be easily detached from their nidus in the ovary. These different sized vesicles gave to the organ the appearance of a bunch of grapes, or a collection of hydatids.

The *oviducts* were very tortuous in the beginning of their course, and about 10 feet long. Their first portion was thin, resembling an intestine; the lower portion, thick and strong. In the right oviduct, 18 inches from the cloaca, was an egg, (about the size of a goose-egg,) easily movable up or down the duct. Over it the walls were much injected, and also for the portion below it. In the left oviduct, 2 feet from the cloaca, was a second egg, and three inches higher up a third. These last could not be readily moved. At each extremity was an elliptical, yellow, fatty mass, about an inch long.

The diameter of the oviduct, 4 inches from the cloaca, was 2 inches; thence it decreased in size. The openings into the cloaca were surrounded by wart-like ragged excrescenses; they were about 2½ inches from the anus.

The *cloaca*, cut open, was 5 inches wide; the openings of the oviducts were 3 inches apart, on the sides of the cloaca; the ureters were two-thirds of an inch apart, on the posterior portion.

The opening of the *larynx* was a longitudinal fissure, an inch in length, bordered by prominent lips; no *epiglottis;* from this to the division of the trachea, 17 inches. The *trachea* consisted of about 60 rings; it was seven-eighths of an inch in diameter at the top, and one-half an inch at the bifurcation. The two terminal divisions of the trachea did not divide into bronchial ramifications, but terminated abruptly by two or three orifices in the general pulmonary cavity of each side. Each *lung* consisted of three principal cavities, communicating freely with each other; the walls were divided and subdivided into innumerable cells, the fleshy compartments of which formed with each other very intricate and interlacing net-works, resembling the columnæ carneæ of the heart. The structure of such a lung will fully explain the coldness of the blood and the muscular inactivity of the reptile. There was no *diaphragm.*

The *heart* is by far the most interesting organ, as it shows an approach to, and, as it were, the connecting link with the birds and mammalia.

In all reptiles, with the exception of the genus Crocodilus, the heart consists of but three cavities; one ventricle and two auricles; the ventricle receiving both arterial and venous blood, and sending this mixed fluid over the system at the same time that it sends to the lungs blood, a portion of which has just circulated through them. The heart of the Crocodilus has a complete partition across the ventricles so as to form *four* cavities, and the circulation is so arranged that while the head and anterior half of the body receive pure arterial blood,

(at least while the animal breathes in the air,) the posterior half receives only a mixed arterial and venous blood: the mingling of the two bloods taking place, not in the heart itself, but by an opening between the two aortas. This was unknown to naturalists till the time of Meckel and Panizza.

Cuvier[1] says there is but *one* ventricle, divided into three compartments: one, inferior and right, which receives the blood of the right auricle and sends it to the left aorta; a second at the middle of the base of the heart, the smallest, in which is the opening of the pulmonary artery; a third, superior and left, receiving the blood from the left auricle and sending it to the true aorta. He says distinctly that blood may pass from the right to the left apartments by filtering through the holes in their partitions. This last he maintains in his second edition, though he confesses he has some doubts on the point. In a note, it is said that M. Martin St. Ange, as early as 1829, made *two* ventricles, with no communication between them; after him Meckel, in 1831, and Panizza, in 1833, maintained that there was no communication between them.

Milne Edwards[2] says that in the crocodiles there is a complete separation between the ventricles, and that the arterial and venous bloods are not mixed until they arrive at the descending aorta; he makes no mention of an opening between the two aortas.

Both Meckel and Panizza say, that from the right ventricle arise the left aorta and the pulmonary artery, and from the left ventricle the right aorta. Müller, Bischoff, and Mayer confirm Meckel's description.

Mr. Hentz[3] allows that two vessels arise from the right ventricle, but he also says that both aortas arise from the left ventricle: he mentions the opening between the aortas.

[1] Leçons d'Anatomie Comparée. Paris: 1839. Vol. 6, pp. 312, et seq.

[2] Elemens de Zoölogie. Paris: 1834.

[3] Transactions of the American Philosophical Society, Philadelphia. 1825. No. 10, p. 216.

Weber[1] maintains that both Cuvier and Meckel are in error; according to him the two ventricles communicate by an opening at the base of the heart; both aortas and the pulmonary artery arise from the right ventricle; the blood from the left ventricle arrives at the right ventricle and the aortas by the opening in the partition: he found only a single valve in the ostea venosa. The heart he examined was sent to him as belonging to the *Crocodilus rhombifer*, but resembled much more the heart of the *boa;* Bischoff says it is extremely doubtful if it was the heart of a crocodile. [*V.* Müller's Archiv. 1836.]

The heart of our specimen agreed very nearly with Bischoff's description in Müller's Archiv. The heart and bulb were 4 inches long, 2 inches wide, and 1 inch thick: its apex was adherent to the pericardium by a short firm membrane. The right ventricle was the largest, but the left perhaps the most muscular; the separation between them was complete. There were three venæ cavæ, two above and one below; the sinus into which they opened was separated from the auricle by two valves; the opening into the ventricle was guarded also by two valves, one large and thin, the other small and fleshy. From the right ventricle arose the pulmonary artery, and the left or *venous* aorta; both had two semilunar valves; at the entrance of the pulmonary artery were eight or ten small fleshy vegetations, arranged in a circle about 4 lines below the valves. From the left ventricle arose only a single vessel, the right or *arterial* aorta having two semilunar valves. The external wall of the two aortas and the pulmonary artery was the same till the division into branches; this formed the *bulb,* of which the pulmonary artery and the left aorta formed the left and lower portion, the right and upper portion being formed by the arterial aorta: all of these vessels were more or less dilated, as if subject to frequent pressure. From the bulb the vessels arose in the following order, from left to right: the *pulmonary*

[1] Müller's Archiv. 1836. p. 1. Paper by Bischoff.

artery, which divided into its two branches before it left the bulb; the *left aorta*, which turned and descended to join the right descending aorta in front of the dorsal vertebræ; the *carotid artery*, which gave off the left subclavian artery about an inch from the bulb; the *right subclavian* artery; the *right* or true *aorta* which descended to join the left. Bischoff (Müller's Archiv. 1836, p. 5,) says there are two carotids; Strauss-Durckheim[1] quotes Meckel as making but one carotid, which after giving off the left subclavian, runs along the front of the cervical vertebræ to the head, where it divides into the right and left carotids. In our specimen what we call the right subclavian artery was cut off quite near the bulb, so that we could not determine whether it bifurcated like the carotid; at any rate, it was very small, about half the size of the carotid where the subclavian was given off. It does not appear that Bischoff had any better authority than Meckel.

In the partition common to the two aortas, just behind their valves, is the opening of communication described by Panizza; it was at least 3 lines in diameter, while in the specimen of Bischoff it was detected only after a very close examination. It was completely hidden behind the valves; it was somewhat easier to pass a sound from the right into the left aorta than the opposite. The edge of the opening was well defined, and of a firm consistence.

The course of the circulation is then through the venæ cavæ to the right auricle, thence to the right ventricle; from this more than half of the venous blood passes through the pulmonary artery to the lungs; the remainder is sent into the left or venous aorta for distribution to the lower extremities. From the lungs the arterial blood enters the left auricle, then passes to the left ventricle, thence pure, through right or arterial aorta to the head and upper extremities, and body generally after mixture with the venous blood.

It is evident that the venous and arterial blood are mixed through the opening in the aortic wall; the question then

[1] Traité d'Anatomie Comparative. Paris: 1843. Tome 2.

arises, does the venous blood of the left aorta pass into the pure blood of the right, or the contrary? Panizza believes the latter, according to Bischoff, from the simple fact that a sound passed more easily from the right to the left aorta than the opposite. Cuvier (op. cit. p. 317,) says this opening is to "introduce a small quantity of oxygenated blood into the left (or venous) aorta."

Dr. Harlan[1] (in his notes of a dissection in 1824,) forced air into the vena cava ascendens, which injected the right auricle and ventricle, and passed into the pulmonary artery, venous aorta, and into the true aorta through the valvular opening at its base. He forced air also into the pulmonary veins, which inflated the left auricle and ventricle, and passed into the true aorta; but it did not pass into the right side of the heart; so that his experiments show that the blood passes from the venous to the true aorta. This is also the opinion of Bischoff, (op. cit. p. 7.)

During the contraction of the ventricles the valves of both aortas being firmly pressed against the opening, no mingling of the bloods can take place; this opening can only be of use during the diastole of the ventricles, when the valves open to prevent regurgitation, and thus leave the opening free. In the ordinary state of the circulation, there would probably be but a trifling mixture, if any; it would be impossible to say in which direction this would take place, as the relative pressure in the two aortas cannot be ascertained. The time when this opening performs its especial function is when the animal is under water; as there is then no respiration nor pulmonary circulation, there is of course no blood in the left ventricle, and none sent through the true aorta. Were it not for this opening, the head and upper extremities, which are supplied by the right aorta, would be completely unprovided with blood; we may naturally conclude that venous blood is sent through the opening from the left aorta to supply these parts.

Thus by its four cavities, the heart of the crocodile resem-

[1] Medical and Physical Researches. Philadelphia, 1835: p. 198.

bles that of the birds; by the mixture of the bloods in the vessels it resembles the heart of the fœtal mammalia. Prof. Meyer compares the left aorta to the ductus arteriosus; he believes this structure temporary, as in mammal fœtal hearts, closing in adult life. Cuvier says he found this opening large in a young *Crocodilus lucius*, and very small in an older specimen, (probably of another species,) he also compares it to the ductus arteriosus, and says it probably closes as age advances. Our specimen was old enough to be impregnated; and the edges of the opening were well defined and firm, like those of a persistent foramen; it had not at all the appearance of an opening that had ever been larger, or one that was gradually growing smaller. Besides there are physiological reasons why it should remain permanent in this animal.

Art. IX. — *Chemical Examination of Algerite, a new mineral species*; by T. S. Hunt, of the Geological Commission of Canada: including a description of the Mineral, by F. Alger.

The mineral here described was placed in my hands by Mr. Alger, more than a year since, with the following description: —

"It is found in the town of Franklin, Sussex county, New Jersey. The crystals are imbedded in a white crystalline limestone, and are without any accompanying minerals excepting a few disseminated scales of graphite. They are occasionally two inches in length and rarely three, and are never more than one-eighth of an inch in thickness. Like Sillimanite and scapolite they are frequently curved. They occur as single individuals and never in groups or radiating masses. When taken from near the surface, the color is a

deep brownish-yellow, which is evidently due to their partial decomposition. Those found at the depth of twelve inches or more, are yellowish-white or straw-yellow, sometimes with a greenish shade ; in a few instances I have found them perfectly colorless and possessing a good degree of translucency. Even the dark yellow crystals, when not decomposing, are slightly translucent, and they then bear a striking resemblance to chondrodite, with which the mineral, when first obtained in a few fragments, was supposed to be identical. It has also been referred to scapolite and spodumene, but it differs from both of these in form and hardness, as well as in other essential characters. In fact its hardness is even inferior to that of laumonite in fresh crystals.

" I believe that Prof. Nuttall was the first mineralogist who expressed the opinion that this mineral might prove to be a new species, but I am not aware that he ever entered into any investigation of its character to satisfy himself upon this point, and for the last ten years, it appears to have been entirely overlooked, the locality even not having come under the cognizance of any mineralogist since his visit to it, until recently explored by myself. The crystals are rhombic prisms, the faces M and M′ inclining to each other at an angle of about 94°, as determined by the common goniometer. In no case have I found an individual, having distinct terminal or basal planes by which to determine the angle of P on M, but an oblique termination of the prism is clearly indicated both by its natural joints and cleavage, so that we have an oblique rhombic prism as the primary form ; the accurate measurements of which further examination must determine. None of the faces are sufficiently brilliant for the reflecting goniometer, although the imperfect cleavage surfaces which may be obtained, parallel with the lateral planes of the prism, sometimes possess considerable lustre ; they present a pearly reflection in spots, the prevailing lustre being vitreous. In its general aspect, when taken from near the surface, the mineral would be described as without lustre and transparency.

"The only modifications of the primary, which have been observed, are the replacement of the oblique and lateral edges of the prism by single planes; they exhibit no striæ."

The crystals are very sparsely disseminated through the coarsely crystalline limestone, and it was with difficulty, that I could obtain sufficient for the purposes of analysis. Those exposed to the weather had become quite friable from partial decomposition, and the larger crystals were more or less interpenetrated by the matrix, which is a pure calcareous spar.

The specific gravity of four light-colored translucent crystals which had been selected with great care and weighed ·2685 grammes, was found to be 2·697, while 1·8 grammes of fragments gave the number 2·712; and some coarser crystals were found to have a specific gravity of 2·948. The hardness when unaffected by exposure is 3–3·5 (Alger); it is brittle, easily separated into fragments. Before the blowpipe it intumesces considerably, and at a high temperature fuses with phosphorescence into a white porous enamel. Pulverized and heated in a tube it gives off abundance of water; the powder moistened with a solution of nitrate of cobalt and heated on platinum foil, fuses into an ultramarine-blue frit.

The crystals selected for analysis were hard, semi-translucent, and undecomposed; their powder, even when elutriated and carefully dried, was of a buff color, which was not changed by ignition. The action of hydrochloric acid upon it at first evolves a little carbonic acid gas from the intermixed calc spar; by digestion it takes up a portion of potash, alumina, iron, and magnesia, while a white granular residue remains. It is however impossible in this way to effect a complete analysis of the mineral, for even after long digestion the decomposition is found to be very incomplete. It was accordingly necessary to have recourse to fusion with an alkaline carbonate; the qualitative analysis thus effected, showed the presence of silica, and alumina with small quantities of iron, magnesia, and lime; the iron probably exists as peroxyd from the color of the mineral, while the lime is evidently present

as a carbonate from the fact that it is at once taken up by hydrochloric acid with effervescence. Another portion of the mineral decomposed by hydrochloric acid, in Laurent's apparatus, gave a large portion of potash, mixed with a little soda; no lithia could be detected in the alkalies.

The quantitative analysis effected by the process above mentioned, gave the following results.

Silica, . . .		49·82	contains oxygen 26·60
Alumina, . . .		24·91	
Peroxyd of Iron, .		1·85	
Magnesia, . .		1·15	
Potash, Soda-traces, .		10·21	contains oxygen 21·11
Water, . . .		7·57	
Lime,	2·20	3·94	
Carbonic acid,	1·74		
		99·45	

The composition of the mineral, deducting the carbonate of lime, is evidently a hydrated silicate of alumina and potash, in which small quantities of magnesia and iron, replace in part the alumina and water. Representing $Al\frac{2}{3}$ (aluminicum) as Alβ, and $Fe\frac{2}{3}$ (ferricum) as Feβ,[1] we have, taking silica as $Si\ O_3$ and considering the Mg as replacing in part H and Feβ, the following formula as very closely expressing its constitution, $5Si\ O_3 + 4HO,\ KO,\ 6\ \frac{6}{10}\ Al\beta O,\ \frac{4}{10}\ Fe\beta O$ or $5Si\ O_3 + 12MO$, which if we take silica as Si O is evidently at once brought to $Si_5\ M_4\ O_9$ or in M. Gerhardt's notation $Si_5\ M_8\ O_9$, which is one of the typical forms which M. Laurent has deduced from his researches on the natural silicates. This requires a ratio between the oxygen of the silica and that of the other oxyds of 5 : 4, and that of the silica being 26·60, theory demands for the bases 21·28 while experiment gives 21·11. Although it will be difficult to arrange the elements found, in a satisfactory manner, according to the ideas of the

[1] Am. Jour. of Science, vol. iv. p. 407.

dualistic school, this close correspondence establishes beyond a doubt the type of the compound.

I have deducted the carbonate of lime and determined the composition of the mineral for 100 parts, and then in accordance with the above formula calculated its composition according to theory. The two results are subjoined.

	Found.		Calculated.	
Silica,	52·28		52·08	
Alumina,	26·08		26·11	
Potash,	10·69		10·88	
Peroxyd of iron,	1·93	11·05	2·45	10·78
Magnesia,	1·20			
Water,	7.92		8·33	
	100·10		99·85	

The attempts to represent the composition of the natural silicates in accordance with the dualistic system, have tended perhaps more than any thing else, to show its inadequacy to the wants of the science. The unnatural complications of atoms which present themselves to the chemist in the usual mineralogical formulas, suggest that we are yet far from the simplicity of nature. In accordance with the unitary system on the contrary, M. Laurent has shown, that by considering the ratio between the oxygen of the silica and that which is contained in the bases present, and keeping in view two simple principles; first, that in their peroxyds, the metals replace hydrogen in two-thirds their ordinary equivalent, and second, that the molecules of a compound are divisible to an unlimited extent, we may reduce all the mineral silicates to a few simple forms.[1]

In the calculation of a formula like the above, it is necessary to keep in view this divisibility of molecules and also the fact that H, Mg, Alβ, Fe, Feβ, K, and other metals, may replace each other to any extent. The FeβO and MgO, which in the calculation are for convenience represented together,

[1] Compt. Rendus de l'Acad., t. xxiii. p. 1050, et t. xxiv. p. 94. See also Am. Jour. of Science, vol. v. p. 405.

supply in the mineral the deficiency which appears in the quantity of water, as well as the fractional equivalent assigned to the alumina.

The mineral above described, from its hardness and specific gravity is evidently to be referred to the order *zeolite*. In its density it approaches datholite and prehnite, to which it is much inferior in hardness, while from the rare species, edingtonite, to which in hardness and density it is closely allied, it is distinguished by its crystallization. Under these circumstances, I offer it as a new mineral species which will take a place by the side of edingtonite; and to connect with his favorite science, the name of one who is among its most successful cultivators, I propose for it the designation of *Algerite.*

Montreal, C. E., May 5th, 1849.

Art. X. — *Examination of a Mineral from Cherokee County, in Georgia.* By Francis Alger.

(Communicated April, 1849.)

It readily scratches quartz, chrysolite, and topaz. It was supposed to be garnet, and in color it approaches the pyrope garnet, of which it has the same lamellar structure in one direction; but is at once distinguished from all the garnets by its greater hardness and specific gravity, and by its characters before the blowpipe. These characters also distinguish it from rubellite, or red tourmaline, with which it has also been confounded. Dr. Feuchtwanger, to whom I am indebted for the mineral, has considered it new, and several other mineralogists who have seen it have not given any decided opinion as to its nature. It seemed to me that a mineral so gem-like in appearance, and possessing such hardness and specific gravity, must be allied to the sapphire class; and my examination of it has now fully identified it with that interesting mineral. It is, in fact, a splendid red sapphire, of a much deeper color than

the variety from Newton, New Jersey, the only American locality which has hitherto afforded good specimens. The mass presented to me, is a portion of a crystal, and presents one of the natural faces of the primary rhombohedron. The fractured laminæ exhibit the usual striæ observed on broken fragments of this gem from other localities, and they have precisely the lustre and transparency of the mineral from Salem, East Indies. They also indicate a rhombohedral cleavage. Before the blowpipe flame it is slowly dissolved with borax into a transparent colorless glass. With salt of phosphorus the smallest portion shows no sign of fusion, and no effect is produced with soda. Dr. Feuchtwanger noticed the reactions of titanic acid in the specimen he examined, which, however, I failed to observe. Titaniferous ores are frequently found accompanying sapphire, and titaniate of oxide of iron may very naturally form one of its chemical constituents, by replacing so much of the alumina, according to the law of isomorphism — crystallized sapphire consisting entirely of alumina and the small coloring admixture of iron. The presence, therefore, of titanic acid has no necessary connection with the determination of the mineral.

There are a few minute blue laminæ on one edge of the specimen, which have not the hardness of the red mineral, though they are much harder than kyanite, the only mineral they resemble, with the exception of sapphirine, a rare substance from Greenland, to which I am disposed to refer them, from the imperfect examination permitted by the smallness of the quantity to operate upon.

Our thanks are due to Dr. Feuchtwanger for bringing to our notice a new locality of this rare and beautiful mineral; and we are led to hope, from the character of the minerals which accompany it, that it may be found in quantities sufficient to answer the demands of mineralogists. Dr. Feuchtwanger proposes to visit the spot very soon, and make known its geological relations and its capabilities of supplying massive emery as an article of commerce hitherto undeveloped in our country.

ART. XI. — *On the Cancellated Structure of some of the Bones of the Human Body.* By JEFFRIES WYMAN, M. D.

(Communicated November 7th, 1849.)

WITH the exception of the great work of Bourgery and Jacob, Traité Complète de l'Anatomie de l'Homme, and the excellent and instructive Outlines of Human Osteology, by F. O. Ward, nearly all systematic treatises are deficient in descriptions of the mechanical arrangement of the cancellated structure of bones. The student will look in vain through the works of Cruvielhier, Meckel, Bichat, Von Behr, Weber, Soemmering, and Wilson, for any allusion to the manner in which the cancelli are arranged, with reference to the weight which they sustain, and the distribution of that weight to the parts on which they rest. The whole subject is passed by without any other notice than that which would be naturally suggested in describing the "spongy," "reticulated," or "cancellated structure," in contrast with the more dense "compact substance," forming the external walls and crust of the different bones. This is the more remarkable, when it is remembered that the bones have been so perseveringly studied, not only as regards their external characters, but as to their microscopic structure and chemical composition.

Sir Charles Bell, in his Treatise on Animal Mechanics,[1] alludes to the direction of the cancelli in the neck of the thigh bone, but his description will be found, on comparison, to be inaccurate. Mr. Quain, in the last edition of his Anatomy,[2] in referring to the cancellated structure of bones, states correctly the general principle according to which these fibres are arranged. "It may be usually observed," he says, "that

[1] Animal Mechanics, or Proofs of Design in the Animal Frame. Published by the Society for the Diffusion of Useful Knowledge.

[2] Human Anatomy, by Jones Quain, M. D. Edited by Richard Quain, F. R. S., and William Sharpey, M. D., F. R. S. First American Edition. Edited by Joseph Leidy, M. D. Philadelphia: 1849.

the strongest laminæ run through the structure in those directions in which the bone has naturally to sustain the greatest pressure." (Vol. I. p. 75.) But he does not adduce a single instance in illustration of his general proposition.

Bourgery and Jacob, to whom the merit belongs of first calling attention to the subject, have recognized its interest, and have shown that there exists in several of the bones a definite relation between the direction of the cancelli and the weight that the bones, of which they form a part, are destined to sustain. Their description of the neck of the thigh bone, it is believed, will be found on comparison to be incorrect. In the lower extremity of the femur, and in both extremities of the tibia, in the astragalus and os calcis, the cancelli are accurately described and figured. Mr. F. O. Ward, in his Outlines,[1] as regards the structure of the bones of the tarsus, simply follows the descriptions of Bourgery and Jacob. He has attempted a description of the mechanical structure of the neck of the thigh, but as will be shown further on, there is sufficient reason for regarding his description, as well as that of the last mentioned authors, incorrect in its details. These constitute the only references which I have been able to find, bearing upon the subject of this communication.

Before proceeding to the detailed description of individual parts, it may be proper to state, in general terms, the inferences which are deducible from the structures of the various bones, and, more especially, from those which assist in maintaining the body in its erect position; — there are two:

1. The cancelli of such bones as assist in supporting the weight of the body are arranged either in the direction of that weight, or in such a manner as to support and brace those cancelli which are in that direction. In a mechanical point of view they may be regarded in nearly all these bones as a series of "studs" and "braces."

2. The direction of these fibres in some of the bones of the human skeleton is characteristic, and, it is believed, has a

[1] Outlines of Human Osteology, by F. O. Ward. London: 1838.

definite relation to the erect position which is naturally assumed by man alone.

These structures are the most conspicuous in the lumbar portion of the vertebral column, in the thigh bone, both in its neck and lower extremity, in the tibia, in the astragalus and the os calcis. It should be remarked, however, in advance, that they are not equally distinct in the bones of all individuals, nor at all periods of life. The cancelli of the bones of young subjects, generally have between them rounded areolæ, and do not appear to assume one direction more than another. In very old subjects they seem to be less clearly defined than in adult and middle-aged skeletons. In these last, while considerable variety exists, I have rarely failed to recognize the general plan of the arrangement of the cancelli. In bones filled with fat the structure is obscured, but it is readily exposed by washing them in a solution of potash or other alkali.

I. VERTEBRÆ.

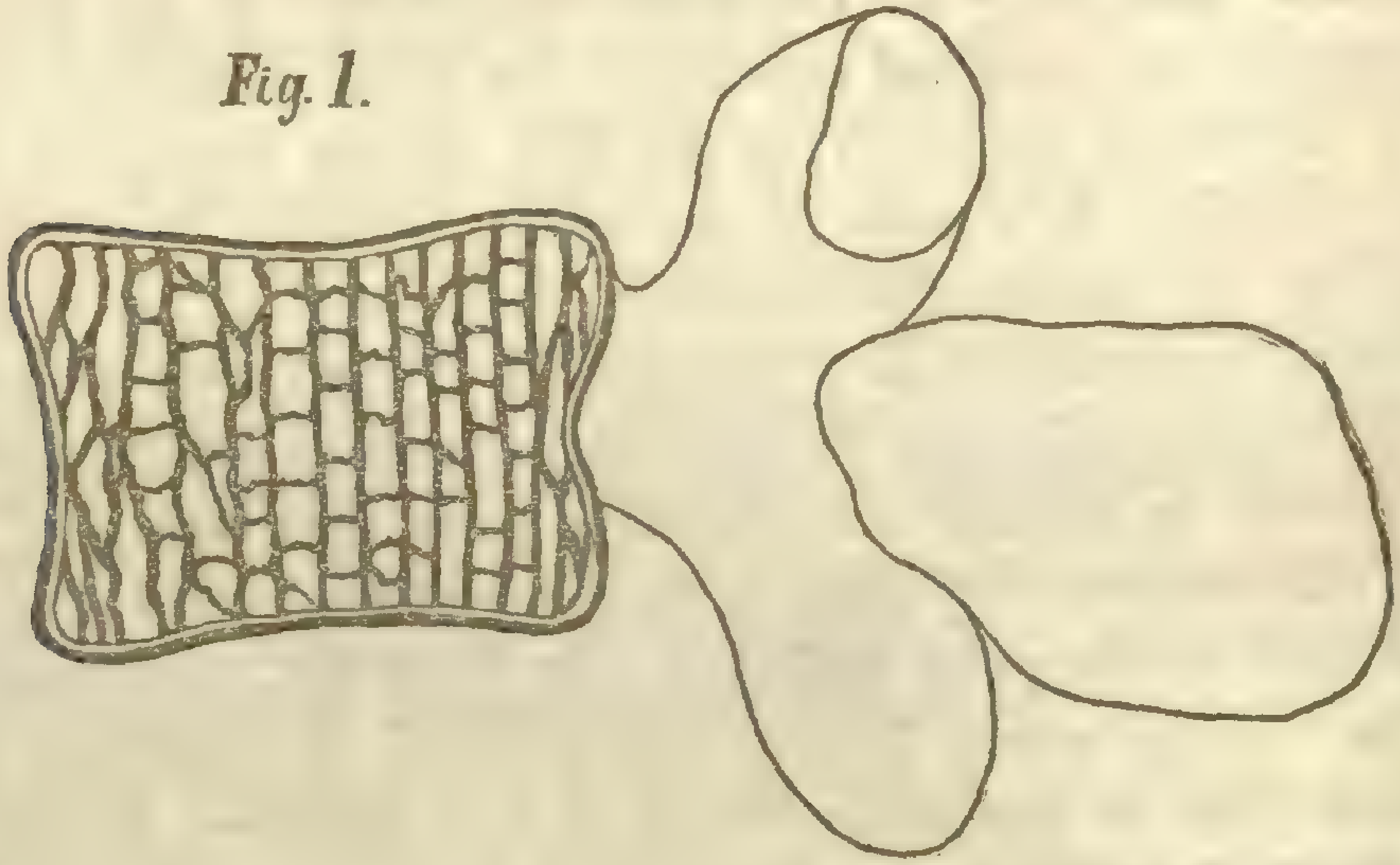
The functions of the vertebræ are threefold; — they serve as columns for the support of weight; they form, by their union, a canal for the lodgment and protection of the spinal marrow; and constitute a series of levers for the application of muscular force. The first of these functions is performed by the "body," whose special use in a given region is to support the weight of the head, arms, and of all that portion of the trunk which is above it; which weight acquires its maximum in the lumbar region, where the vertebræ acquire their greatest size. The pressure on all the vertebræ is vertical.

If a section be made through a lumbar vertebra, the areolæ between the cancelli will be found to have generally a quadrangular form, and the direction of the cancelli either vertical or transverse. (Fig. 1.[1]) The vertical ones extend-

[1] This and the following diagrams are intended merely as *plans* of the cancelli, the different lines representing their general directions. For accurate figures of the bones described, except the neck of the thigh, the vertebræ, and astragalus, see the plates of Bourgery and Jacob.

ing from the upper to the lower face of the vertebra, receive the weight which they sustain on their ends; and this they

Fig. 1.



will sustain in virtue of their rigidity. If they have a tendency to yield, it is either by being crushed, or by bending in a lateral direction. This last is prevented by the transverse cancelli which are placed at right angles to the vertical ones, and serve the purpose of "braces." The cancelli of the lumbar vertebræ are, therefore, arranged in conformity with the demand for resistance. The arrangement in question is rarely obvious above the last dorsal vertebra; it is, however, present in precisely that part of the column where the pressure, and, consequently, the demand for resistance is greatest.

II. NECK OF THE THIGH BONE.

The whole weight of the head, trunk, arms, and pelvis, rests on the heads of the two thigh bones, or, more or less on one of them, according to the attitude of the body when in a state of rest. When the body is in motion they will sustain, in addition to this, the momentum of the trunk as it descends upon them in walking, running, jumping, &c. The heads of the bones are themselves immediately supported by the neck, the axis of which forms an angle of about 120° with that of the shaft of the bone, if the lower angle be

measured, or of 60° if the upper.[1] The weight of the body will, therefore, have an angular bearing upon the axis of the neck, and its tendency will be to bend or break the neck in a downward direction. The means which nature has adopted to counteract this tendency, consist: —

1. In making the vertical diameter of the neck the largest, a section at right angles to its axis being oval, and the long diameter perpendicular.

2. In increasing the thickness of the wall of bone on the under side of the neck and adjoining portion of the shaft, on to which a large portion of the weight of the body is directly transmitted.

3. In having the cancelli of each femur so arranged as to form a segment of a framed arch or truss, which coöperates with the external shell in sustaining the weight of the body; the necks of the two femora forming together opposite segments of an arch.

The first and second of these conditions has been frequently adverted to by anatomical writers, but the third has almost invariably escaped observation.

Sir Charles Bell, whose views of the animal mechanism are generally so beautiful and true, has not manifested his usual accuracy in his description of the structure of the neck of the

[1] This measurement was made from the specimen which has served for the present description. Great confusion exists in systematic treatises, with regard to the size of the angle which the neck makes with the shaft of the femur. Some writers describe it only in general terms, as Meckel, who refers to it as "un angle presque droit;" Soemering, "un angle aigu;" Cruvielhier and Quain, as "an obtuse angle," &c. Where more precise statements are made, great difference will be found, not only as regards the number of degrees which the angle is estimated to make, but, also, with regard to the angle which is measured; some measuring the angle which the axis of the neck makes with that of the shaft below their union, and others with the continuation of that axis above it. In order, therefore, to compare the different statements, it will be necessary to give, in each case, the complementary angles, and then we can designate the corresponding angles. The angle which the neck makes with the shaft, is, according to

Ward,	125°	comp. angle		55°.
B. Cooper,	45°	"	"	135°.
Morton,	35° - 40°	"	"	145° - 140°.

Comparing the corresponding angles we have 125°, 135°, 140°, and 145°, giving a variation of 20°.

thigh, as given in his tract on Animal Mechanics. One who examines this bone, he says "will find that the head of the thigh stands obliquely off from the shaft, and that the whole weight bears upon what is termed the *inner trochanter;* and to that point, as to a buttress, all those delicate fibres converge, or point from the head and neck of the bone."[1] A careful examination of a section of the part in question will show that this description of the cancelli is imperfect as well as incorrect; that the cancelli do not centre on the lesser trochanter, as this process is situated not on the under side of the neck, but on the posterior and inner face of the upper portion of the shaft, and does not, therefore, come within their range. The cancelli converge and bear upon the under thickened and arched shell of bone, but their common centre is at least an inch exterior to and below it.

Bourgery and Jacob, in speaking of the internal structure of the head and neck, describe the first as provided with cancelli forming circular areolæ; the second as made up of two portions — an inferior one consisting of "small parallel columns, which evidently transmit the weight of the superior segment of the head on to the inferior border of the neck. Those parts which are out of the line of pressure, (*hors de la ligne de pression,*) having nothing to support, will be formed of a more delicate tissue." They also recognize a mass of fibres which enclose the vascular canals, and which "seems to have for its object the union of the head and trochanter with each other and with the shaft of the bone." "It communicates with the head and neck by a fasciculus of radiating fibres, and with the trochanter by a strong lamina, which bifurcates, intercepting two reticular spaces, and externally joins the compact substance. Inferiorly this lamina is again made to bear on the compact substance by a bundle of vertical columns; the central mass descends vertically for the space of an inch and a half in the direction of the axis of the bone, and then expands into a cone which joins the circumference.

[1] Op. cit., p. 14.

This cone divides into two masses; an external stronger one descends obliquely to the right and left, joins the compact substance of the opposite planes of the bone; the internal line follows the course indicated by the base of the neck, and limits the triangular space comprised between it and the great fasciculus of support."[1]

This description is too much confused to be understood without the aid of their figure; and this, it is believed, will be found on comparison with a section of the bone itself to be an inaccurate representation of its structure. The description is correct, as far as it relates to the fibres which transmit the weight from the head to the under side of the neck, though they are not parallel; the "central mass" I have not been able to make out, and, as for that portion which is "out of the line of pressure," it has not a structure different from the adjoining parts, and, like them, it performs an important office in sustaining the weight of the body.

Mr. Ward, in his description of the neck, approaches nearer the truth, though he seems to have misconceived the plan of its structure. He recognizes three series of fibres, one of which extends from the head to the under surface of the neck (Fig. 3. *a*); another forming a series of pointed arches which abut on the outer and inner walls of the base of the neck (*b b*); and a third extending from the summit of this arch to the first series (*c*); the whole of which he compares to a bracket (*d*); series (*a*) resisting by its rigidity, (*c*) by its tenacity, and (*b*) forming the "archwork," which gives the last its points of resistance. The cancelli of the triangular interval between these three, he says, present no determinate arrangement. In the sequel it will appear that neither the interval which he describes, nor the archwork exist.

According to the view which I wish to advance, and which seems to approach much nearer the truth than either of those above referred to, two series of cancelli exist; one of these (Fig. 2, *a a*) rests or abuts on the convex surface of the thick

[1] Bourgery and Jacob, Op. cit. Tom. I. p. 118.

shell which forms the under wall of the neck, and from this they diverge towards the upper portion of the head, neck, trochanter major, and that portion of the shaft just below this last; those which extend into the head are much the longest. The fibres of the second series (*b b*) are arranged in parallel

Fig. 2.

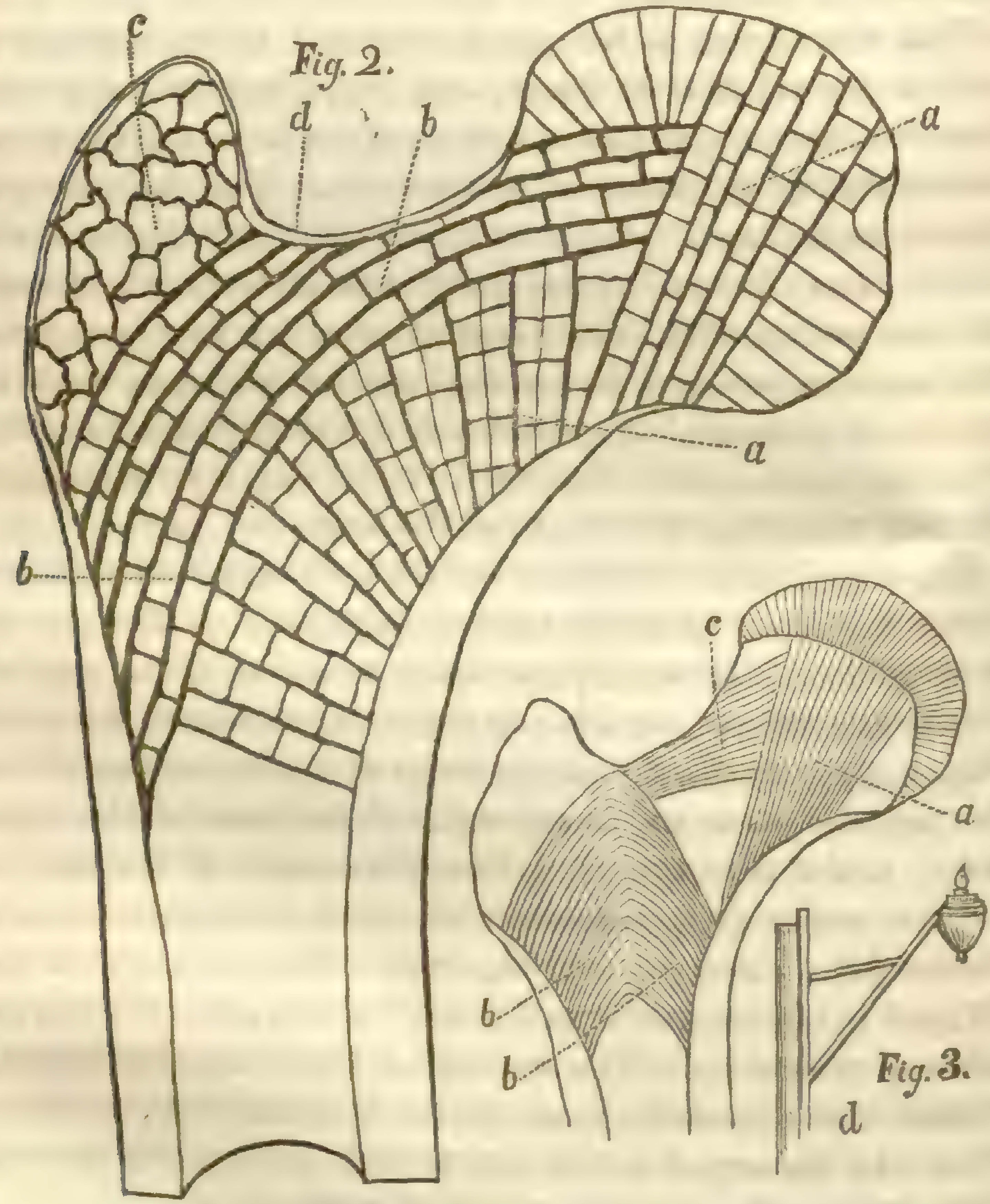


Fig. 3.

curves, the extremes of which are attached on the one hand to the wall of bone at the base of the great trochanter, and the other to that portion of the preceding class of fibres which supports the upper surface of the head, as well as to the shell of bone between it and the trochanter at (*d.*) Both of these

series are braced by other fibres, which are arranged at right angles to their direction. The cancelli of the great trochanter, at (*c*) have no determinate form.

If this description be correct, the "archwork" described by Mr. Ward does not exist, nor the more complex arrangement described by Bourgery and Jacob. In fact, an arch which should be made to resist force in this direction, would not be used in accordance with recognized architectural rules. An arch is usually made to resist or sustain pressure in lines perpendicular to its surface; but is not adapted for opposing lateral traction.

The upper series of fibres will get their points of resistance on the wall of bone below the trochanter, and not on the supposed archwork. The curved fibres (*b b*) will resist in virtue of their tenacity, and the straight or radiating series (*a a*) in virtue of their rigidity. One resists and is adapted to resist pressure, and the other resists and is equally adapted to resist traction.

We can appreciate the effect which force applied to the head of the femur would have upon its shell and cancelli, by calling to mind what takes place in a cylinder or tube when an attempt is made to bend it. If it be but slightly elastic, it will become more or less flattened or collapsed on the side toward which it is bent; if sufficient force be applied, when it yields it will bend into an angle on the concave side, but the convex side still retaining its curve. The tenacity of the material being greater than its rigidity, it yields to pressure rather than tension, the concave side of the tube being compressed, while the convex stretches. The same effect will be still better seen in bending the branch of a tree, when the bark, if it yield on the convex side, will be torn asunder, whereas on the concave side it is thrown into folds. The shell of the neck of the thigh may be regarded as a bent tube, and is adapted to resist pressure by its oval form, the longest axis being vertical; and secondly, by the greater thickness of the concave side of the neck, to which the weight is more

directly transmitted, and which in consequence of its curved form, is more likely to yield to compression than the convex surface on the opposite side to traction.

The walls of the bone are still further supported by the disposition of the cancelli, which act as so many braces within. In addition to this, however, these last form a segment of an arch, and themselves support directly a portion of the weight of the body, and transmit it to the walls of the neck. If on the application of weight to the head of the bone, the neck yield at all, the effect will be tension of the fibres (*b b*); and in consequence of their resting beneath upon the fibres (*a a*) compression of these last.

It is worthy of notice in connection with these directions of force, that the radiating series, (*a a*,) which support pressure by their rigidity, are the strongest, and the series at right angles and between them, which serve as braces, are more slender; while in the curved series, (*b b*,) which resist by their tenacity, are the strongest, and the braces which may be regarded as a continuation of the radiating series, are the weakest; precisely as would be the case in the frame of a building; the braces of the circular series become stronger as you approach the centre of the bone where the pressure becomes the greatest.

The shell of the neck is of itself sufficient to support great weight, in virtue of its form and structure; but its power of resistance is still farther increased by the cancelli, which form within a light truss or framed arch; the long fibres at (*a*) transfer weight directly to the under side of the neck. They, as well as the shell of the neck at (*d*,) are supported by the curved fibres (*b b*) and these in turn by the radiating fibres (*a*.) The whole may be regarded as equivalent to an increased thickness of those portions of the shell of bone above and below, which are the seats of the greatest strain and pressure.

The weight of the body is transmitted through the shaft of the femur to the condyles below, the space between these sustaining but little pressure. The lower portion of the thigh

has only a thin shell, but here its diameter is largest and filled with the cancellated structure, which especially in the lateral portions has a very definite arrangement; the cancelli forming a series of pillars, which ascend very nearly vertically from the surfaces of the condyle to the walls of the bone above them, which are bent inwards as the bone diminishes its diameter towards the middle of the shaft. A corresponding arrangement exists in the two extremities of the tibia, where the surface which is the seat of pressure is sustained by columns of bony fibres extending to the walls above or below it, according as the upper or lower portion of the bone is examined. This structure has been distinctly figured and described by Bourgery & Jacob.[1] The cancelli are, as in the parts before described, prevented from lateral flexion by braces which are interposed at right angles to their direction.

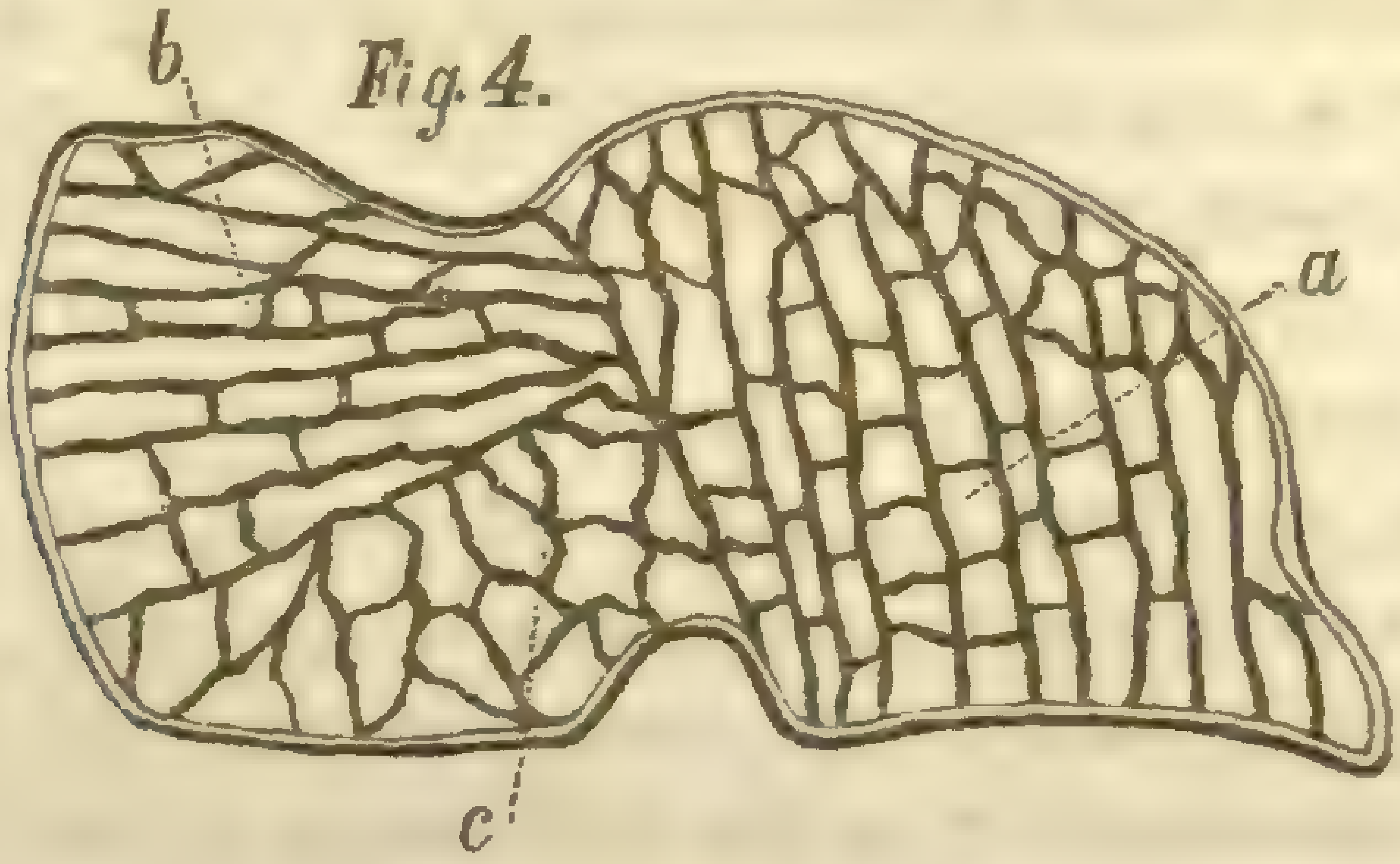
IV. ASTRAGALUS.

The tibia alone bearing vertically on the astragalus, this last bone will necessarily sustain in each foot one half the weight of the body, or the whole of it when it is supported on one foot. When the small size of the surface on which the tibia rests is borne in mind, it will be readily anticipated that in its internal structure it will give us another illustration of mechanical adaptation. The astragalus, though it receive so many shocks in the violent movements of the body and is called upon to resist so much vertical force, is nevertheless a light bone and presents areolæ in its interior of large size. The astragalus rests below on the os calcis, by means of two articulating surfaces of different sizes, and in front on the scaphoid bone, so that whatever pressure is transmitted to it is in turn transferred to the surfaces of the bones just named, with which it is in contact. The pressure is therefore transmitted in two directions, but as the astragalus, by means of its greater articulating surfaces, rests mainly on the os calcis, the larger amount is transferred in the direction of this bone.

[1] Op. cit. Tome I. pp. 119 and 121, also Pl. 43, Figs. 3, 4, and 7.

On making a longitudinal section of this bone (Fig. 4.) two

Fig. 4.



series of cancelli are distinguishable at sight—one, a nearly vertical series (*a*,) one end of which sustains the arched portion of the astragalus on which the tibia bears, and the other rests on the surface beneath, which articulates with the os calcis; the second (*b*,) a horizontal series nearly at right angles to the preceding, one end of which rests on the vertical series and the other on the surface articulating with the scaphoid bone. In the angle formed by these two series is a third (*c*,) much less regular, the direction of which is not well defined, but has a general tendency downwards and forwards towards the anterior and inferior articulating surfaces of the bone. This portion sustains no direct pressure.

V. OS CALCIS.

It is through this bone that the weight is at last transmitted to the ground, and this takes place in two different directions; one directly through the tuberosity of the heel, and the other indirectly through that surface which articulates with the cuboid bone, and this in turn with the 4th and 5th toes. The os calcis, however, does not simply form a basis of support; it is at the same time one of the arms of a lever by which the body is raised from the ground under the influence of great muscular action. The whole foot forms an arch, one end of which springs from the ground in the os calcis, and the other from "the ball of the foot" or the ends of the metatarsal

bones. The arch is formed by the metatarsal and tarsal bones, the centre of which corresponds with a line passing transversely through the scaphoid and cuboid bones. By reference to the skeleton, it will be seen that the surface of the astragalus, on which the tibia rests, and the surfaces of the os calcis, which support the astragalus, are behind this centre of the arch; consequently, the weight of the body will be thrown more upon the os calcis than upon the metatarsal bones. A section through this bone (Fig. 5.) gives two series of cancelli,

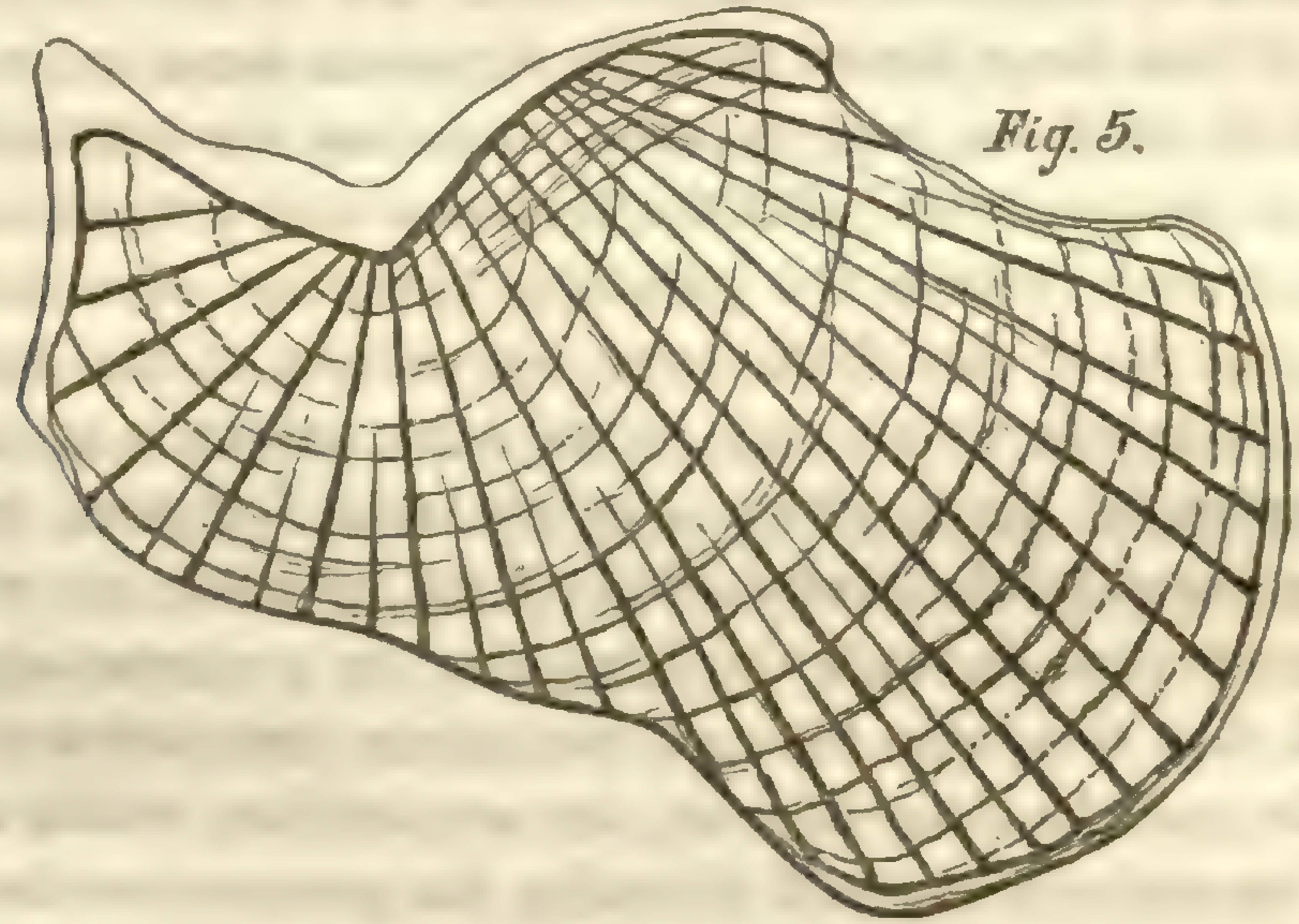


Fig. 5.

one radiating from the upper surface towards the two surfaces on which the bone rests, and more sparingly to the intervening portions; a second series at right angles to the last and which, as the former radiate from a common centre, will necessarily assume a curved direction. By far the largest portion of the first, are directed towards the tuberosity of the heel, which serves the double purpose of a base and lever. In that portion which is just beneath the articulating surface, and which does not come within the range of either of the surfaces of support, may be regarded as forming an inverted arch.

The os calcis of man contrasts with that of other animals, not only in its size and relation to the rest of the foot, but in its minute and internal arrangement, so that the assertion

made by Mr. Lawrence many years ago, independently of its structure within, that "*ex calce hominem*" would be a safer rule, than "*ex pede Herculem*," gains additional force.[1]

In the above descriptions the minute structure of several bones has been described as well as the nature of the force which they are intended to resist. It is not always safe to attempt to assign the final cause of animal structures, to indicate the intention of nature in certain conditions of things — though there can be no risk in describing in connection such conditions of organization as co-exist. As to the individual bones, it has been shown in what direction force or weight is applied to them, and in what direction the cancelli are arranged within them. On the lumbar vertebræ there is vertical pressure; within, the principal fibres are also vertical. On the neck of the thigh bone the weight of the body is applied obliquely to the end of an arm; within it there is a combination of fibres, giving strength with lightness, which forms a frame mechanically adapted for resisting the weight which rests upon it. On the astragalus the pressure again is vertical, but this bone rests on two others, one below it, the os calcis, and the other in front, the scaphoides; within there exists two series of cancelli directing the pressure on the surfaces of support, and very nearly the same description applies to the os calcis. A certain direction of fibres in all these instances co-exists with a certain direction, or certain directions, of the transmission of pressure. From this constant association of structure and function, the inference seems unavoidable, that they are means and ends.

The next subject for consideration is, as to the existence of some more general condition to which these individual instances are subservient — and this involves the necessity of inquiring, to what extent similar structures exist in other members of the Mammiferous series? After having made numerous sections of the corresponding bones of other animals, scarcely any indications of these peculiar arrangements

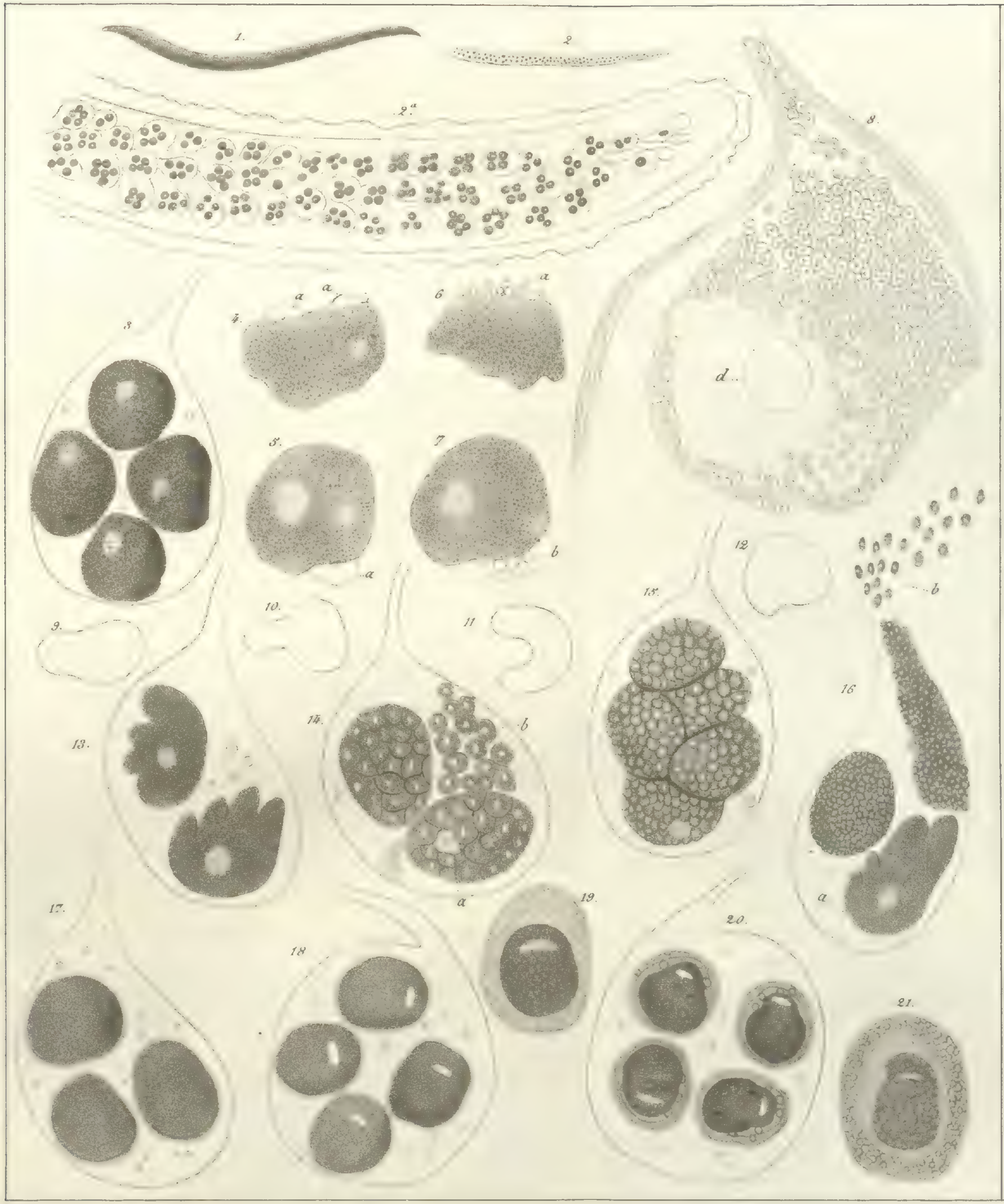
[1] Lectures on Physiology, Zoölogy and the Nat. Hist. of Mar, p. 124. Lond. 1822.

of the cancelli have been demonstrated. The columnar arrangement of the bony fibres of the vertebræ seems the most common. As a general rule, the strength of the bone seems to be obtained in other mammals at the expense of its lightness, by giving greater thickness and density to the outer shell, as well as by stouter cancelli with smaller areolæ. The peculiar structure of the neck of the thigh, and of the astragalus seems to exist in man alone. The only animals in which I have detected any approach to the structure of the neck of the thigh in man, is in the two species of anthropoid African apes, the Chimpanzee (*Troglodytes niger*,) and the Engé-ena (*T. gorilla*,) the two species which stand at the head of the brute creation, and which of all brutes make the nearest approximation to the erect attitude. In these, slight traces of the truss-work described in man, exist, but in them as in other animals the shell of the neck is much stouter and thicker.

The structures which have been described in this communication are found mainly, if not solely, in the bones connected directly with locomotion. And as they exist in man alone, or certainly present in him the highest degree of perfection, we cannot escape the conviction that they relate to the kind of locomotion which he alone of the whole animal series can be said to possess, namely, that of walking erect, and which requires in the passive and resisting organs subservient to it, in order that it may be effected with ease and grace, a nice combination of lightness with strength in the materials. His attitude more than any other, in consequence of the pillars of support being arranged in vertical planes, requires the most effectual means for counteracting shocks; for in all other mammals the points of support are usually four, and at the same time the bones of the legs make angles more or less acute with each other, and therefore are in a condition to yield readily by flexion to any increased force; and this is true of all birds and reptiles. In the elephant, the thigh bones are vertical, but they are nearly at right angles with the vertebral column, and the pillars of support are four instead of two.

From the considerations which have now been offered, it is believed that the two propositions which were stated at the commencement of the article, have been sustained, and that if any additional facts were necessary to show that the human skeleton deviates widely in the details of its structure from that of all brutes, even the most anthropoid, we should have a characteristic sign in the arrangement of the cancelli of such of his bones as play the most important part in sustaining and moving his body.

PL. 1.



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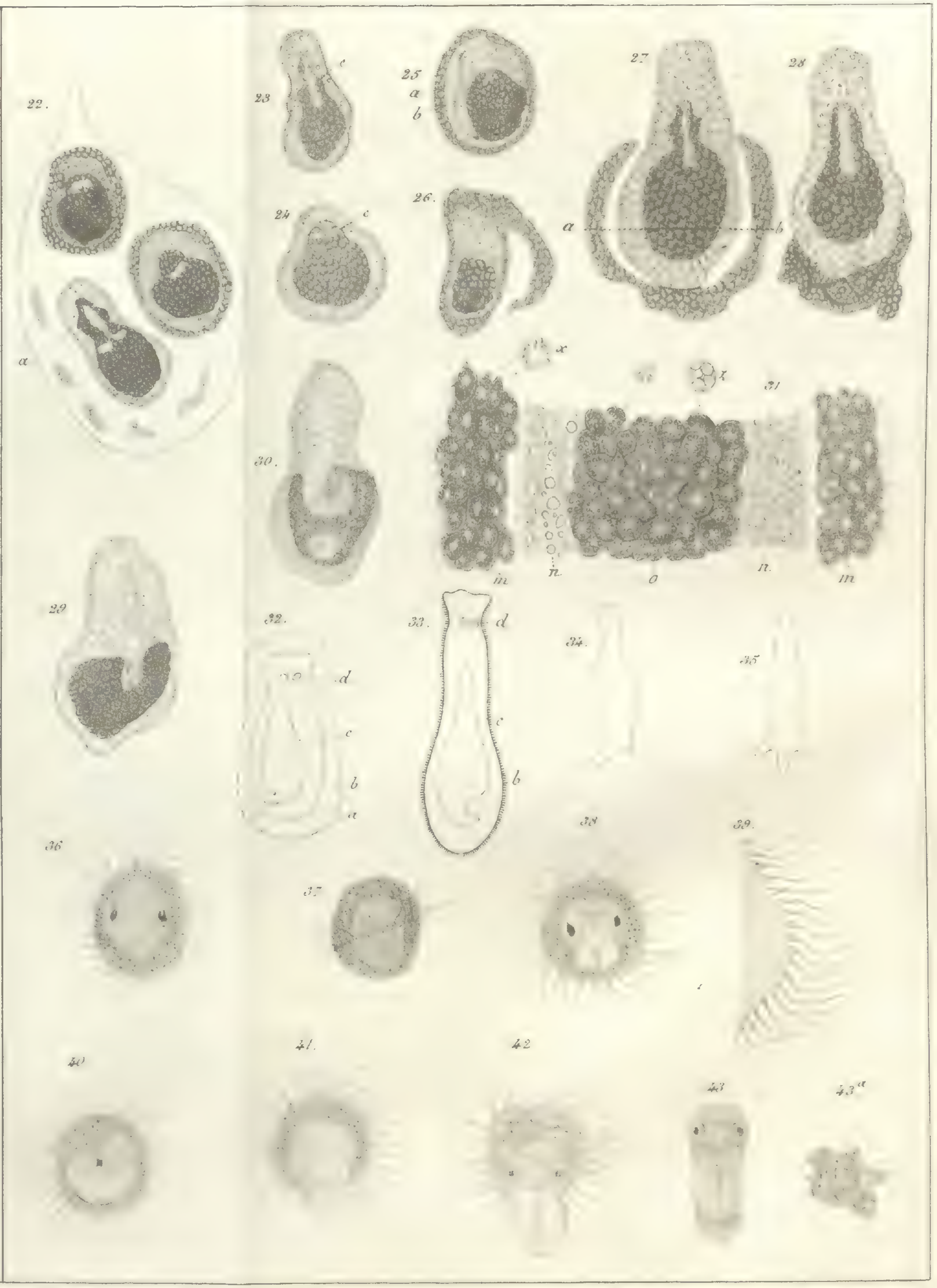

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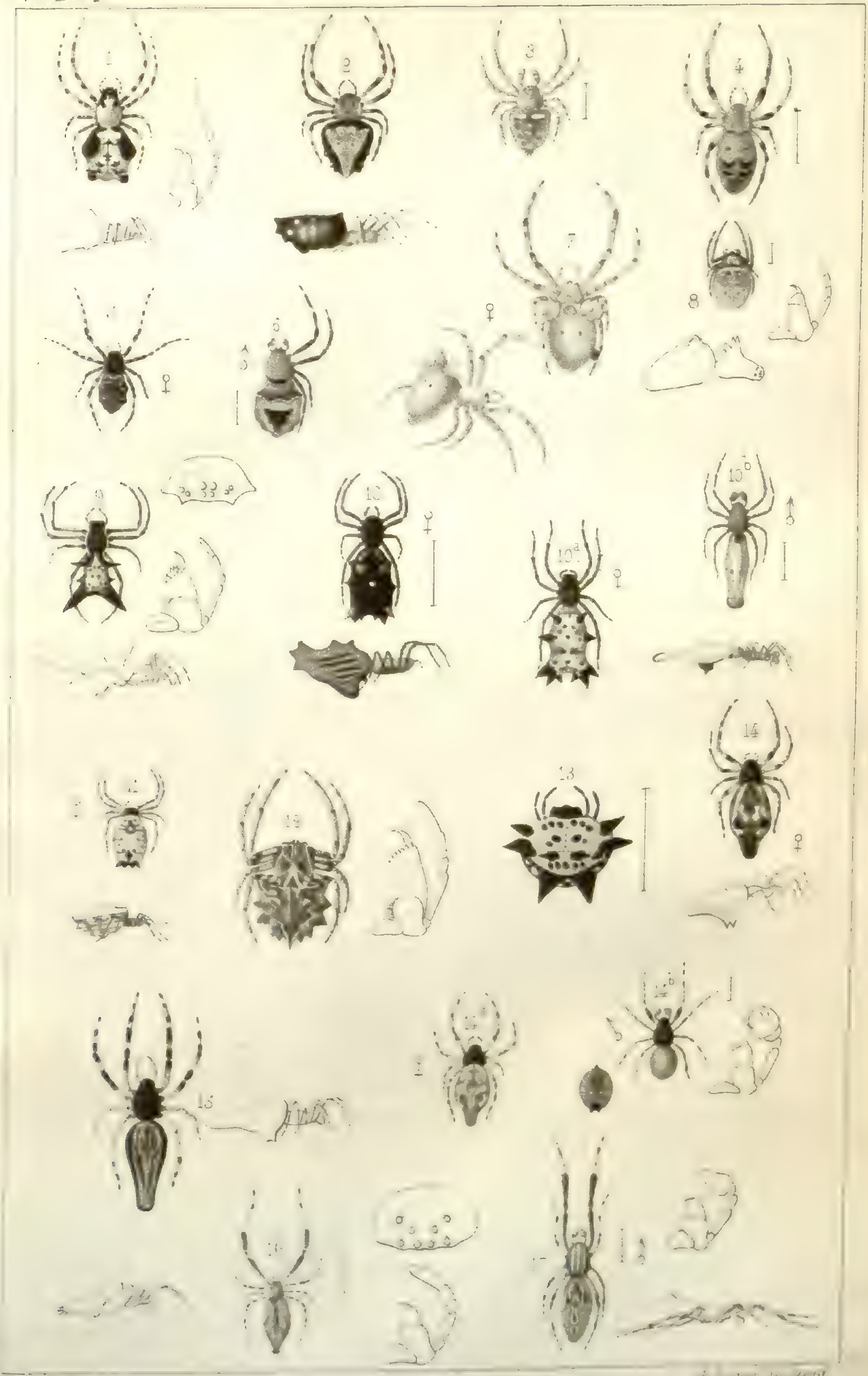
A. Sonrel lith. Cambridge

EMBRYOLOGY OF NEMERTES OBSCURA. (DESOR)



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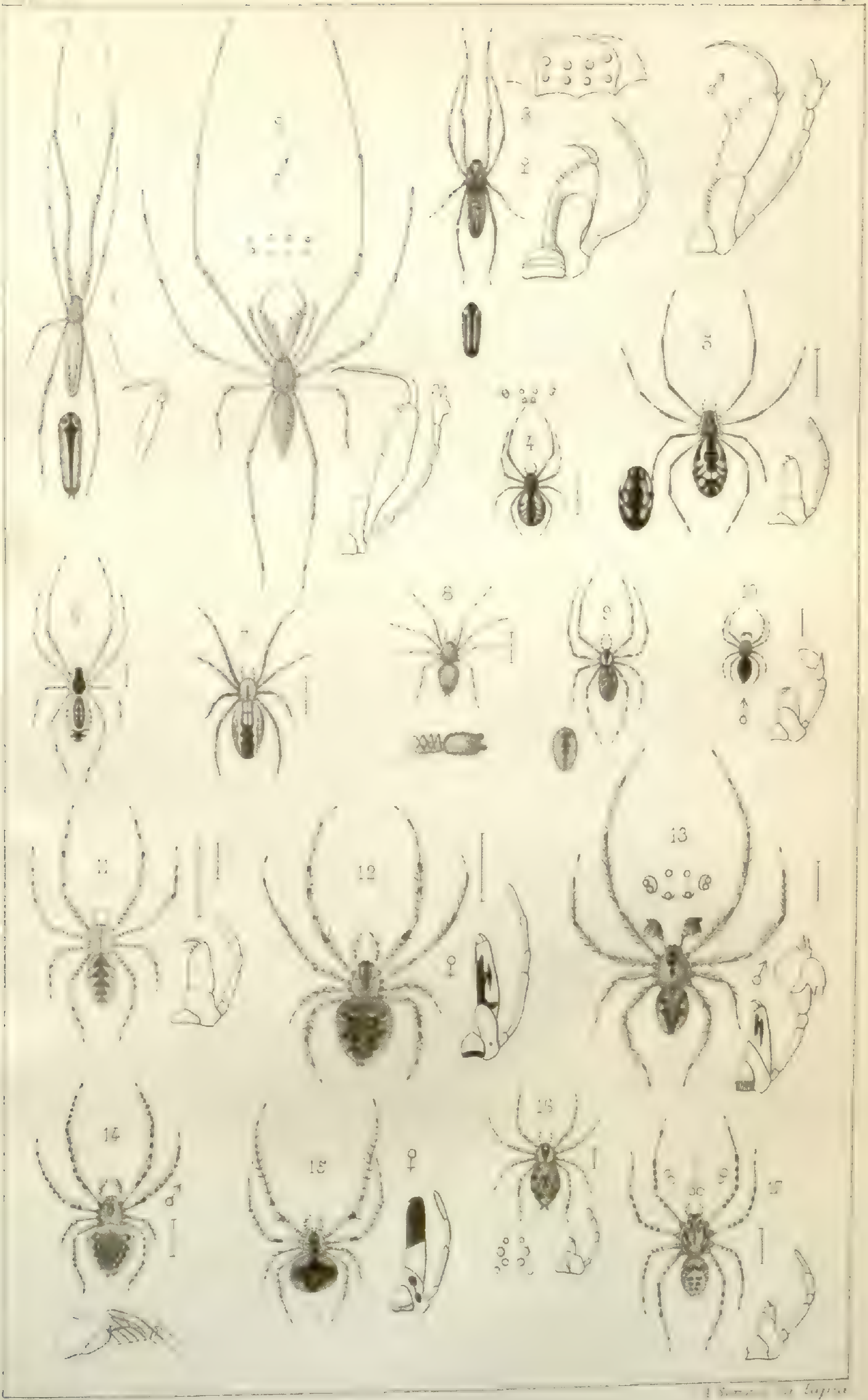

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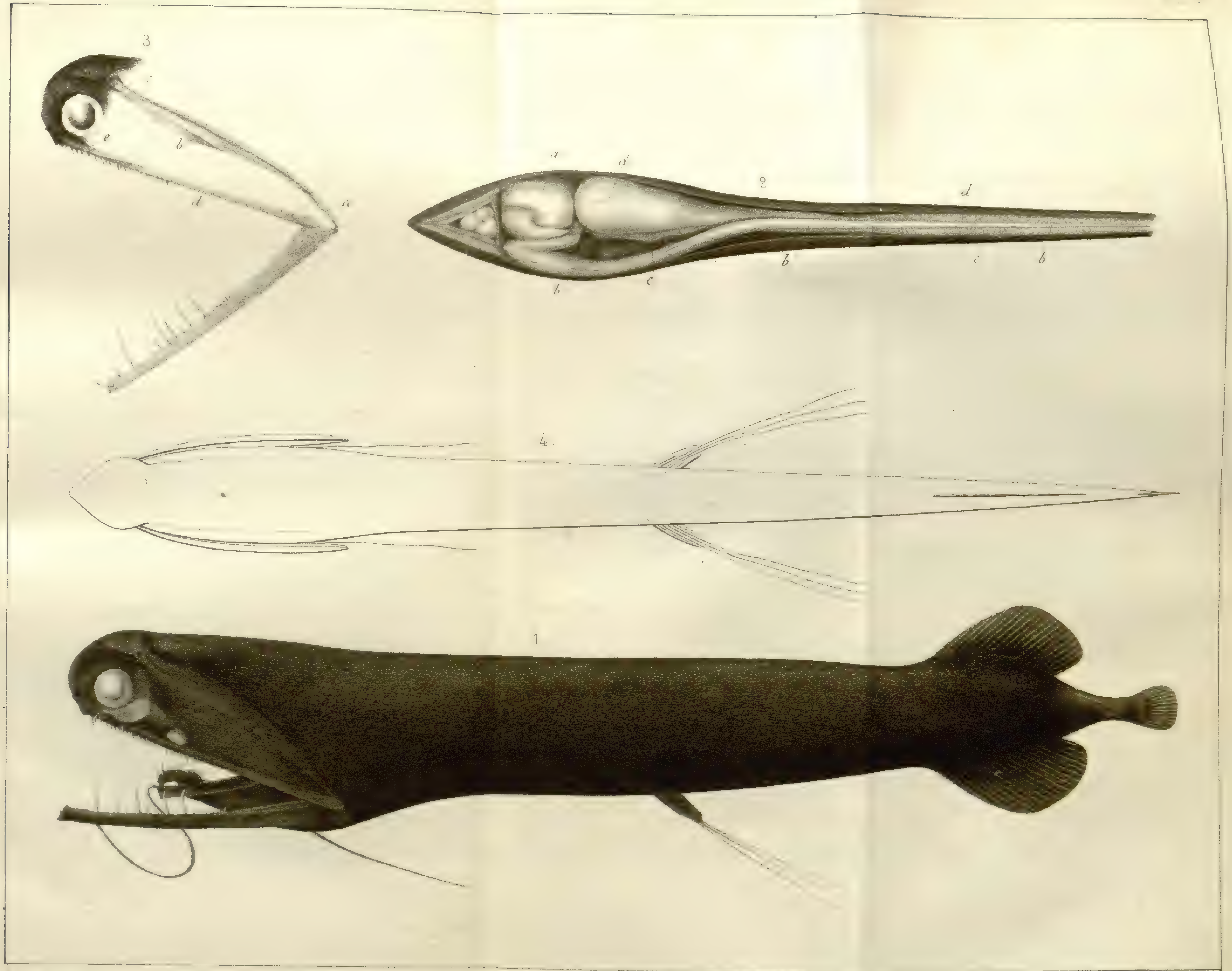
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BOSTON

JOURNAL OF NATURAL HISTORY.

VOLUME VI. — NO. II.

Art. I. — Plantæ Lindheimerianæ, Part II. *An Account of a Collection of Plants made by* F. Lindheimer *in the Western part of Texas, in the Years* 1845 – 6, *and* 1847 – 8, *with Critical Remarks, Descriptions of new Species, &c.* By Asa Gray, M. D.

[The numbers follow on from the end of the former collection, as published in Vol. V. of this Journal, through the collection of 1845 – 6, and thence to the later collection. Those inclosed in ( ) belong to the collection of 1847 – 8; for greater convenience in describing them, they are here intercalated. The few numbers in brackets below 319 belong to species which occurred in the former distribution. Those marked with a † in place of a number have not been distributed at all. The orders elaborated by Dr. Engelmann have his name affixed to that of the Order.]

RANUNCULACEÆ.

319. Clematis Drummondii, *Torr. & Gray, Fl.* 1. p. 9. Dry prairies, Comale Spring, &c. June. Cultivated in the Cambridge Botanic Garden, from Texan seeds, this plant climbs extensively, but does not show its blossoms until October. The calyx is yellowish green, tinged with purple.

320. Ranunculus repens, *Linn.* var. macranthus: petalis 7 – 16; caulibus petiolisque villosissimis. R. macranthus, *Scheele in Linnæa*, 21, *p.* 585. Sparsely on high, rocky plains, and in patches on damp Muskit (Algarobia) flats, New Braunfels. March. — Mr. Wright has specimens

of the same plant, with the leaves also densely silky-villous, nearly as much so as in R. canus, *Benth. Pl. Hartw.* No. 1626, from California; indeed, it would seem to belong to the same species; but the carpels are, as in our *R. repens,* pointed with a pretty long, straight, or flexuous beak, slenderly subulate from a broad base, and not "mucrone valde recurvo fere circinnato," as *R. canus* is characterized. My specimen of the latter exhibits no fruit. The petals are in some specimens nearly an inch in length; in others no larger than in ordinary American forms of *R. repens,* into which it passes by every kind of gradation.

† Delphinium virescens, *Nutt. Gen.* 2, p. 14; *Torr. & Gr. Fl.* 1. p. 32; floribus albis. Rocky prairies and hills, Comale Spring. April. The species is very likely to be considered as only a broader-leaved variety of *D. azureum.*

321. D. virescens, *Nutt.*, var. floribus subcæruleis. Dry and rocky prairies, and margins of thickets, New Braunfels. April.

BERBERIDACEÆ.

322. Berberis (Trilicina, *Gray,*) trifoliolata, *Moricand, Pl. Nouv. Amer.* p. 113, t. 69. B. ilicifolia, *Scheele in Linnæa,* 21, p. 591, non *Forst.* B. Rœmeriana, *Scheele,* l. c. 22, p. 352. High shore of Matagorda Bay. Also common in the interior of Texas, on Comale Creek, at New Braunfels, &c. (575.) An evergreen shrub, with few branches, but with many stems from the same base, often forming large thickets. It flowers in February and March; and the yellow blossoms exhale the odor of saffron. The globose berries, about the size of peas, ripen in May, are red, aromatic, and acid; they are called "currants" by the inhabitants, and are used for tarts, &c. This interesting species, which is remarkable for its palmately trifoliolate leaves, is first mentioned in the Appendix to the first volume of the *Flora of N. America,* as having been gathered by Drummond without flower or fruit. In 1841, it was named and characterized

by Moricand, from flowering specimens which occurred in Berlandier's Texan Collection. We have now fine specimens both in flower and fruit from Mr. Lindheimer's, Mr. Wright's, and from Dr. Gregg's collections; the latter met with it as far south as Buena Vista. I have characterized it as a third section of Berberis, in the *Genera Am. Bor.-Or. Illustrata*, 1. p. 80.

CRUCIFERÆ.

323. STREPTANTHUS PETIOLARIS, *Gray, Pl. Fendl.* p. 7. Muskit thickets and shady woods, New Braunfels and San Antonio. March. — All the lower leaves, as well as the base of the stem, are more hairy in my specimen than in those cultivated in the Cambridge Botanic Garden, from seeds taken from Mr. Wright's plant; and the radical leaves are barely lyrate-pinnatifid, and rounded at the summit. From seeds sown in early spring, it flowers and fruits during the summer and autumn.

† S. BRACTEATUS (*Gray, Gen. Am. Bor.-Or. Ill.* 1. p. 146, t. 60. fig. 1–3.): glaberrimus, subglaucus; foliis caulinis auriculato-amplexicaulibus, inferioribus oblongis acutis sæpe repando-dentatis, superioribus cordatis sinu profundo clauso in bracteas cordatas (inferiores florem, summas pedicellum subæquantes) sensim decrescentibus; petalis obovatis purpureis; siliquis angustis prælongis (5½–6 unc.) patentibus subfalcatis. — At New Braunfels. June. Also gathered by Mr. Wright on sand bars of the Colorado, near Austin, in flower only, in the month of April. The radical leaves are sometimes entire or barely repand-toothed, sometimes incised or even lyrately pinnatisect, with most of the lower segments minute. One of Mr. Wright's specimens is remarkable for having all the lower cauline leaves pinnately parted in this way, and petioled. The sepals are tinged with deep purple; the petals are light purple, with the broad spreading lamina half an inch in length. No ripe pods were gathered. The largest seen are about six inches long, but less than a line wide; the immature seeds are winged. I have no specimens

of *S. obtusifolius* nor of *S. maculatus*, with which last especially our plant should be critically compared. But Dr. Torrey informs me that these species want the bracts, so uncommon in Cruciferæ, and which so conspicuously distinguish *S. bracteatus*.

324. Erysimum Arkansanum, *Nutt. in Torr. & Gr. Fl.* 1. p. 94; *Gray, Gen. Ill.* 1. t. 63. Wooded, rocky banks, &c., Comale Spring, and on the Guadaloupe. March, April. — A showy species, with large, deep, golden yellow, and faintly fragrant flowers. It was found on the Rio Grande by Mr. Wright.

325. Vesicaria Engelmanii (*Gray, Gen. Am. Bor.-Or. Ill.* 1. p. 162, t. 70): perennis, pube lepidoto-stellata argentata; caulibus e caudice sublignoso plurimis simplicibus erectis superne parce foliatis; foliis inferioribus spathulatis seu oblanceolatis rariter repando vel sinuato-dentatis in petiolum attenuatis, superioribus sublinearibus integerrimis; racemo etiam fructifero brevi sæpius corymbiformi; silicula globosa glaberrima breviter stipitata 5–12-sperma (loculis 8-ovulatis) stylo pergracili breviora; seminibus submarginatis; funiculis septo longe adnatis. — Pebbly shore of the Guadaloupe, New Braunfels. May. Chiefly with mature fruit. (The same species, apparently, with elliptical and entire radical leaves, was found on the Upper Canadian, by Mr. Gordon.) From Lindheimer's seeds, this handsome and very distinct perennial species is in cultivation in the Cambridge Botanic Garden. It makes a strong, deep root. The clustered, simple stems rise to the height of a span or a foot, are clothed, like the foliage, with a silvery pubescence composed of dense and closely appressed stellar tufts, and are terminated by a short and dense, usually umbelliform, raceme of golden yellow flowers, which are fully as large as those of *V. grandiflora*, the petals being half an inch long. Lower leaves two to three inches in length. The style is one third of an inch in length. I should have adopted Dr. Engelmann's or Lindheimer's name of *V. umbellata*, under which the specimens were sent,

and which is not inappropriate to this form, where the pedicels are as long as the axis of the fruiting raceme, except that, in the cultivated and some wild specimens, the raceme elongates in fruit to the length of three or four inches, as in the succeeding.

(576.) V. Engelmannii, var. β. elatior: racemo fructifero extenso (3 – 4-pollicari). V. pulchella, *Kunth & Bouché, in Ann. Sci. Nat. 3-ieme Ser.* 2, p. 229 (Apr. 1849.) ex char.

326. V. angustifolia, *Nutt. in Torr. & Gr. Fl.* 1. p. 101. Summit of hills, in large patches, on stony soil, New Braunfels. March, in flower. Accords entirely with the original specimens. What Scheele has taken for this species is evidently *V. recurvata*, at least in part.

327. V. Lindheimeri (*sp. nov.*): radice crassa perenni; caulibus decumbentibus foliosis cinereis; foliis oblongis argute sinuato- vel laciniato-dentatis imis lyrato-pinnatifidis pube implexa appressissima (e pagina superiore sero subdecidua) argenteo-incanis; racemo fructifero elongato; silicula ovoideo-globosa glaberrima stipite plus duplo stylo subduplo longiore; seminibus immarginatis. — Black, stiff prairie soil on the lower Guadaloupe, east of Victoria. February, in flower and fruit. — This appears to be a truly perennial species, and is remarkable for its strongly toothed leaves, as well as for the matted, extremely fine and close-pressed, silvery pubescence which clothes them. The upper surface of the older leaves, however, is merely cinereous with minute and rather sparse stellar down. Petals apparently light yellow, three or four lines long.

328. V. densiflora (*sp. nov.*): annua v. biennis, pube stellata laxa cinerea; caulibus adscendentibus usque ad flores foliosis; foliis oblongo-spathulatis vel oblanceolatis basi attenuatis sæpius repando-denticulatis, radicalibus integris; racemo etiam fructifero denso multifloro, pedicellis erectiusculis; silicula estipitata subdepresso-globosa glaberrima stylo breviore 10 – 16-sperma (loculis 8-ovulatis); seminibus im-

marginatis; funiculis septo longe adnatis. — Prairies near Victoria, on the lower Guadaloupe; February, in flower. Gravelly banks of streams, Fredericksburg; May, in fruit (577.) (Also, near Austin, *Mr. Charles Wright.*) — Stems numerous from the same root, rather stout, spreading or ascending, 5 to 10 inches long, leafy to the top. Leaves equally cinereous both sides, as well as the stem and pedicels, with a rather loose stellar pubescence; the cauline an inch or less in length; even the radical undivided and barely repand or repand-denticulate. Flowers bright yellow, smaller by about one third than those of *V. grandiflora.* The remarkably dense raceme becomes in fruit from two to four inches long, often ripening as many as fifty silicles; the lower pedicels usually subtended by leaves. Silicles two lines in diameter, slightly didymous as well as depressed, not strictly sessile on the receptacle as in *V. grandiflora*, but raised on a barely appreciable stipe. Style fully two lines long. Seeds small, not at all margined. — This well-marked species appears to be common in Texas, especially throughout the Western districts. But I do not find that it has yet been described.

† V. GRANDIFLORA, *Hook. Bot. Mag.* t. 3464. var. β PINNATIFIDA: foliis radicalibus majoribus interrupte pinnatipartitis segmentis dentatis lobatisve, caulinis sæpe subpinnatifidis. — Prairies east of Victoria; February, in flower. The same form was gathered by Mr. Wright. — *V. grandiflora* is well distinguished from all the other species (of which a goodly number are now known in North America) by the unusually short style, the narrowly winged seeds, and the large flowers and pods.

329. V. ARGYRÆA (*sp. nov.*): perennis, pube lepidoto-stellata undique argentea; caulibus diffusis v. procumbentibus foliosis; foliis omnibus spathulatis integerrimis vel repando-dentatis; racemo laxifloro, fructifero elongato; pedicellis sæpius patentibus apice sursum curvatis; silicula globosa estipitata glaberrima stylo æquilonga oligosperma (loculis 16 – 18-ovulatis); seminibus immarginatis. — V. arctica var.? *Gray, Pl.*

Fendl. p. 9. — Sandy banks of Green Lake, near Matagorda Bay, and prairies near Victoria; February, in flower and half-grown fruit. Also gathered by Mr. Wright on the Rio Grande, Texas; by Dr. Gregg at Buena Vista, and Dr. Edwards at Monterey, Northern Mexico; and by Fendler at Santa Fe, in flower only. The species assumes a variety of forms, according as it flowers early near the root, or from long procumbent stems. In the first case the pedicels are more upright; in the latter they are spreading and upwardly curved, as mentioned in the specific character. They are sometimes subtended by leaves; and the racemes in Dr. Gregg's specimens are occasionally proliferous. The bright yellow flowers are about half an inch in diameter. The plant is silvery with crowded, but distinct, appressed, scurfy stellæ.

330. V. RECURVATA (*Engelm. ined.*): tenella, pube minuta lepidoto-stellata cinerascens; caulibus e radice annua plurimis gracilibus diffusis vel procumbentibus ramosis; foliis spathulatis integerrimis aut radicalibus repandis lyratisve, supremis sublineari-oblongis; racemis elongatis sparsifloris; pedicellis sæpe secundis, fructiferis recurvis; silicula vix aut ne vix stipitata globosa glabra oligosperma parva stylo tenui breviore vel subæquali; seminibus immarginatis. — V. angustifolia, *Scheele, in Linnæa,* 21, p. 584, non *Nutt.* — Dry and stony or light soil, growing sparsely in the grass, San Antonio and New Braunfels. March, in flower; April and May, in fruit. Also around Austin, *Mr. Charles Wright.* — The most slender species; with diffusely spreading stems, from four to eight inches long, and short, spathulate or oblong-spathulate leaves. The flowers are not larger than those of *V. gracilis,* which it most resembles, and from which it is at once distinguished by its nearly or quite estipitate silicles, pendulous on the recurved pedicels. The pods are a line, or little more, in diameter.

331. V. GRACILIS, *Hook, Bot. Mag.* t. 3533. Muskit Flats, in wet or low, grassy places, New Braunfels. April, May. — Stems upright or nearly so, slender, from 8 to 16

inches long. The pods, in the stronger specimens, are twice as large as in Hooker's figure and description.[1]

(216.*) DRABA PLATYCARPA, *Torr. & Gr. Fl.* 1. p. 108. This is not the same as No. 216 (*D. cuneifolia*) of the former

[1] VESICARIÆ Boreali-Americanæ Synoptice Dispositæ.

Sect. I. VESICARIANA, *DC.* Silicula globosa, raro pyriformis, valvis membranaceis inflatis.

§ 1 *Annuæ seu biennes.*

* *Seminibus marginatis; stylo silicula (estipitata) dimidio vel ultra breviore; foliis caulinis basi sæpe auriculatis et subamplexicaulibus.*

1. V. GRANDIFLORA (*Hook. Bot. Mag.* t. 3464): caulibus pube brevi subcinereis; foliis sæpe sinuato-pinnatifidis dentatisve; stylo silicula 2–3-plo breviore. V. brevistyla, *Torr. & Gr. Fl.* 1. p. 102 (*vide Suppl.* p. 668.) The septum is not veinless, as is said by Don, but has a midnerve stretching from the apex towards the base, as is usual in the genus.

2. V. AURICULATA (*Engelm. & Gray, Pl. Lindh.* No. 217, p. 32): caulibus pedunculisque hirsutis; floribus minoribus; stylo silicula dimidio brevioribus.

** *Seminibus immarginatis; stylo silicula subæqualibus aut longioribus; foliis omnibus basi angustatis.*

† *Silicula vix aut ne vix stipitata, globosa.*

‡ *Racemo etiam fructifero densifloro; pedicellis erectiusculis vel subpatentibus.*

3. V. DENSIFLORA, (*sp. nov.*) Vide supra, No. 328.

4. V. ANGUSTIFOLIA, *Nutt. in Torr. & Gr. Fl.* 1. p. 101. Vide supra, No. 326.

5. V. SHORTII, *Torr. & Gr. Fl.* 1. p. 102. — The silicles, in the specimen of *Herb. Torr.*, the only one I have ever seen, are nearly all sterile and imperfectly grown; hence their small size in proportion to the length of the style. In one pod, however, although remarkably small for the genus, I found a single ripe (marginless) seed, nearly filling the cell; in this case the style was no longer than the silicle. The species, although not sufficiently well known, is unlike any other here enumerated.

‡‡ *Racemo sparsifloro; siliculis nutantibus.*

6. V. RECURVATA, *Engelm.* Vide supra, No. 330.

†† *Silicula breviter stipitata obovato-globosa seu pyriformi; foliis caulinis subrepandis.*

7. V. NUTTALLII (*Torr. & Gr. Fl.* 1. p. 101): subcinereo-puberula; filamentis basi ampliatis; silicula pyriformi juxta basim constricta.

8. V. REPANDA (*Nutt. in Torr. & Gr. l. c.*): glabrata; floribus majoribus; filamentis e basi dilatata sensim angustatis; silicula immatura subglobosi-obovata. — There are no specimens with full-grown silicles, while those of *V. Nuttallii* are altogether fruitful, with no good flowers. There is much reason to suspect that the two belong to one species. *V. Nuttallii* usually has a shorter but distinct stipe to the pod; but in one of the original specimens the stipe is fully as long as in *V. gracilis.*

††† *Silicula manifeste stipitata, exacte globosa.*

‡ *Floribus saturate flavis.*

9. V. GRACILIS (*Hook. Bot. Mag.* t. 3533): glabrata, erectiuscula; foliis lanceolatis subintegerrimis; racemo laxifloro elongato; pedicellis elongatis patentibus; silicula glabra stipite duplo longiore stylo pl. m. breviore. — The silicles of Berlandier's and Drummond's specimens are, as described and figured by Hooker, "not larger than hemp seed." In those of Lindheimer, where the whole plant is stronger, and in

distribution. Thickets, New Braunfels, &c. February. D. Rœmeriana, *Scheele in Linnæa*, 21, p. 583, would seem to be

cultivated specimens, the silicles are considerably larger. The stipe is sometimes almost as long as the pod; sometimes scarcely half that length.

10. V. GORDONI (*sp. nov.*): tomentuloso-canescens; caulibus diffusis; foliis subintegerrimis, infimis subspathulatis, superioribus lanceolatis vel linearibus; racemo fructifero laxo; pedicellis brevibus patentibus; silicula glabra breviter stipitata stylo subduplo longiore. — On the Canadian, in the Raton Mountains, *Mr. Gordon*, (communicated by Dr Engelmann.) April; in flower and fruit. — This is, perhaps, a perennial species, but the root appears more like that of a biennial. The plant is silvery-hoary, with a stellate pubescence; except the pods, which are very smooth, and two lines in diameter. Flowers not larger than those of *V. gracilis*, more crowded. The unripe seeds are not at all margined.

‡ ‡ *Floribus albidis; siliculis nutantibus.*

11. V. PALLIDA (*Torr. & Gr. Fl.* 1. p 668, *Suppl.*): pube minuta lepidoto-stellata subcinerea; caulibus adscendentibus ramosis; foliis oblongis plerisque laciniato-dentatis basi attenuatis, radicalibus sublyratis; racemo laxifloro; pedicellis fructiferis recurvis; silicula globosa glabra leviter stipitata stylo tertia parte longiore. — V. grandiflora β. pallida, *Torr. & Gr. l. c.* p. 101. — The corolla is said, by Dr. Leavenworth (who alone has met with this plant) to be "*white.*"

§ 2. *Perennes (Argenteæ seu incanæ.)*

* *Seminibus levissime marginatis; silicula substipitata stylo breviore.*

12. V. ENGELMANNII, *Gr. Gen. Ill. t.* 70. Vide supra, No. 325.

** *Seminibus immarginatis; silicula stipitata stylo duplo longiore.*

13. V. LINDHEIMERI, *sp. nov.* Vide supra, No. 327.

*** *Seminibus immarginatis; silicula non aut vix stipitata.*

† *Stylo silicula æquilongo v. longiore.*

‡ *Caulibus elongatis decumbentibus; foliis spathulatis; silicula glabra.*

14. V. ARGYRÆA, *sp. nov.* Vide supra, No. 329.

‡ ‡ *Caulibus abbreviatis suffruticosis; foliis angustis; silicula glabra.*

15. V. FENDLERI, *Gray, Pl. Fendl.* p. 9.

16. V. STENOPHYLLA (*sp. nov.*): humilis, cano-argentea, multiceps; foliis anguste linearibus gracilibus confertis; racemo multifloro denso; silicula membranacea glaberrima stylum æquante. — On the Rio Grande, Texas, *Mr. Charles Wright.* Monterey and Aguaneuva, Northern Mexico, *Dr. Gregg, Dr. Edwards.* — The specimen of Mr. Wright is the most characteristic one. From a thick, ligneous caudex it bears several, more or less woody branches, a span high, densely leafy, and terminated by a very compact raceme of golden yellow flowers, nearly as large as these of *V. grandiflora.* The plants of Gregg and Edwards are less condensed, and with smaller flowers. The leaves are an inch or more, the lower over two inches in length, entire, or the lower sparingly toothed; and the pods, also, are twice the size of those of *V. Fendleri.* Specimens intermediate between the two may perhaps occur.

‡ ‡ ‡ *Caulibus herbaceis erectis vel adscendentibus; silicula globoso-obovata incana.*

17. V. LUDOVICIANA, *DC. Syst.* 2, p. 297; *Hook. Fl. Bor.-Am.* 1, p. 48. V. globosa, *Desv. Jour. Bot.* 3, p. 171 & 184, ex char.

† † *Stylo silicula globosa glabra vel stellato-puberula, 2-3-plo longiore.*

18. V. ARCTICA, *Richards. Appx. Frankl. Journ.*; *Hook. l. c.*

a form of the same species, or perhaps of *D. cuneifolia*. To the latter, as a slender form, or to *D. micrantha*, would seem to belong D. filicaulis, *Scheele, l. c.*

CAPPARIDACEÆ.

332. Polanisia trachysperma, *Torr. & Gr. Fl.* 1. p. 669; *Gr. Gen. Ill.* 1. t. 79, & *Pl. Fendl.* p. 10. Sandy soil, on the Colorado and Pierdenales. July, October. This differs from *P. uniglandulosa*, as I have formerly remarked, principally in the smaller size of the flowers. It is likely to prove only a northern form of that species.

POLYGALACEÆ.

333. Polygala Lindheimeri (*sp. nov.*): pubescens; caulibus e radice incrassata lignea plurimis foliosis; foliis alternis subsessilibus coriaceis utrinque reticulatis nitidis cuspidato-mucronatis, imis obovatis, superioribus gradatim ovatis oblongis et lanceolatis; racemis terminalibus demumque lateralibus laxifloris; rachi geniculato-flexuosa bracteis parvis ad nodos 3 persistentibus squamosa; pedicellis brevissimis; sepalo superiore bracteiformi a flore subdistante alis spathulatis vix dimidio brevioribus; carina imberbi crista calcariformi aucta; capsula immatura pilosula. — Rocky declivities of the upper Guadaloupe and Pierdenales. June, August. Also met with by Mr. Wright, from the Colorado to the Rio Grande. — Root not unlike that of Krameria lanceolata, long, covered with a thick reddish bark. Stems a little woody at the base,

Sect. II. Alyssoides, *DC.* Silicula ovata, valvis convexis rigidiusculis.

19. V. alpina, *Nutt. in Torr. & Gr. Fl.* 1. p. 102; *Gr. Pl. Fendl.* p. 9.

V. lasiocarpa, *Hook. ined.* (Vide *Bot. Mag.* sub t. 3464) is unknown to me. I have seen no Texan species with other than glabrous fruit.

V. argentea, *Schauer in Linnæa*, 20, p. 720, when the mature fruit is known, may prove to be a species of Synthlipsis.

V. didymocarpa, *Hook.*, and V. Geyeri, *Hook.* constitute the genus Physaria.

The Iberis, *n. sp.? Torr. in Ann. Lyc. New York*, 2, p. 166, from Dr. James's Collection, is Dithyræa Wislizeni, *Engelm. in Wis. Rep.* p. 96, which has recently been met with, in flower only, on the Upper Canadian, by Mr. Gordon.

branching, a span to a foot high, clothed with a soft spreading pubescence. Leaves from 5 to 10 lines long, coriaceous, minutely pubescent but shining, with a prominent midrib, the veinlets conspicuously reticulated on both surfaces. Racemes gradually prolonged so as to bear from 10 to 20 flowers in the course of the season; the joints of the remarkably zig-zag rachis from one to three lines long. Pedicels shorter than the calyx, 3-bracteate. Upper sepal a little remote from the flower, like a bractlet, ovate-oblong, concave, with the rudiment of a gland in its axil. Stamens 8, subdiadelphous. The galea of the carina is beardless, and bears a conspicuous, straight spur on the back in place of a crest. The ripe fruit is unknown. The large upper sepal is persistent at the base of the half-grown fruit, after the others have fallen. All the sepals are deciduous in what I take to be P. ovalifolia, *DC.*, which was gathered on the Leona and Rio Grande by Mr. Wright, as well as by Dr. Edwards and Major Eaton at Monterey, &c.

KRAMERIACEÆ.

(13.) Krameria lanceolata, *Torr. in Ann. Lyc. New York*, 2. p. 168; *Gr. Gen. Ill.* 2, t. 185, 186. New Braunfels, among rocks. April, June. "Roots often more than three feet long."

VIOLACEÆ.

(578.) Ionidium lineare, *Torr. in Ann. Lyc. New York*, 2, p. 168; *Torr. & Gr. Fl.* 1. p. 145; *Gr. Gen. Ill.* 1, t. 82. I. stipulaceum, *Nutt. in Torr. & Gr. l. c.* Stems much branched from a ligneous perennial root, diffuse, or the branches often erect. Leaves opposite or occasionally alternate, entire or remotely serrulate; the lower varying from lanceolate to oblong or obovate; the upper linear, obtuse, usually three or four times the length of the stipules. Seeds turning black. — I possess no perfectly authenticated specimens of I. stipulaceum, *Nutt.*; but I have good reason to

think that it is not specifically different from the plant which was earlier indicated (from a branch, bearing narrowly linear leaves alone) by Dr. Torrey, under the name of *I. lineare;* which name I have therefore adopted. The stipules should not have been termed "minute" in *I. lineare,* since they are further said to be "one-third the length of the leaves." The upper ones are seldom so long as this, while the lower are frequently "half as long as the leaves," as they are said to be in *I. stipulaceum.* It is manifest that all our specimens belong to one and the same species.

> 344. I. LINEARE, *Torr.*, ramis floriferis erectis strictioribus. I. stipulaceum, *Nutt. l. c.* Damp Muskit flats, San Antonio. April.

CARYOPHYLLACEÆ.

335. PARONYCHIA LINDHEIMERI (*Engelm. ined.*): annua, glabra, erecta; caule ramosissimo diffuso in cymas apertas multoties dichotomas diviso; foliis setaceis, superioribus bracteisque consimilibus mucronatis internodio brevioribus; calyce basi breviter pubescentibus, laciniis in aristulam iisdem duplo breviorem productis. — Naked, rocky places in high prairies. September. (Also gathered in Western Texas, by Mr. Wright. — Nearly allied to *P. setacea,* and very similar in aspect, foliage, flowers, &c., but the cymes are more open; the calyx minutely pubescent, instead of strigose-hirsute, at the base; and the awns much shorter than its segments, instead of being nearly of their length. The plant is smoother, often six inches high, and very much branched.

(222.) P. DICHOTOMA, *Nutt. Gen.* 1. p. 159; *Torr. & Gr. Fl.* 1. p. 171. High, rocky places, north of New Braunfels. August, October.

336. STELLARIA PROSTRATA, *Baldw. in Ell. Sk.* 1. p. 518. Rocky and shaded margins of rivulets, about the Comale Springs, and at New Braunfels; flowering from March to October. (Also Trinity Bay, *Mr. Wright.*)

PORTULACACEÆ (by *Dr. Engelmann*).

(579.) Talinum aurantiacum (*n. sp.*): radice tuberosa; caule adscendente herbaceo ramoso patulo piloso; foliis lanceolatis s. lineari-lanceolatis subsessilibus carnosis; floribus axillaribus singulis; pedunculis supra basin articulatis bibracteolatis, fructiferis reflexis; sepalis ovatis acuminatis tricarinatis, fructiferis subpersistentibus; petalis ovatis mucronatis; staminibus sub-25; seminibus lineis gyratis carinatis et striis tenuissimis transversis eleganter notatis. — On the Sabinas, and more abundantly on the Liano, rare about New Braunfels, on rocky soil or almost naked rocks; in flower principally in July and August, but also at other seasons, always after heavy rains. — Root white, fleshy, tuberous, often bifurcated. Stems 8-16 inches long, ascending, much branched. Leaves $1\frac{1}{2}-2$ or even 3 inches long, 2–4 lines wide. Peduncle 4–5 lines long. Sepals of the same length; petals 5 lines long and 3 wide, orange to red; filaments red; style and stigma orange. Seeds elegantly marked, black, larger than in any other North American species. — Distinct from all other species described by De Candolle, by the single flowers.

(580.) Talinum sarmentosum (*n. sp.*): radice crassa; caule prostrato; ramis debilibus sarmentosis ascendentibus foliosis; foliis carnosis late ovatis cuspidatis basi attenuatis subsessilibus; cymis axillaribus bracteatis subtrifloris (rarius compositis) versus apicem laxe paniculatis; floribus longe pedicellatis; sepalis ovatis cuspidatis membranaceis deciduis; staminibus sub-15; seminibus nigris nitentibus sub lente tenuiter tuberculatis. — New Braunfels, among shrubs on the banks of the Guadaloupe. July, September. — Stems prostrate; branches weak, ascending, supported by the shrubs under "which the plant grows, often 6–10 feet long;" — the specimens before me are 2–4 feet long. Lower leaves $2\frac{1}{2}-3\frac{1}{2}$ inches long, $1-1\frac{3}{4}$ wide. Pedicels 6–12 and more lines long, thickened at the apex. Sepals about one line long; flowers apparently

4 – 5 lines in diameter, purple. Capsule about one line long, almost globose. Seeds smoother than in any other of our species.[1]

[1] "Besides these two species, we have in the flora of the United States, three others very different from these, but nearly related to one another; namely, the well-known *T. teretifolium*, Pursh, *T. calycinum*, Engelm. in Wisliz. Rep.; and *T. parviflorum*, Nutt.; all three now in cultivation with me, and well distinguished from one another. *T. calycinum* is very ornamental; the large flowers have sometimes six to ten petals.

"Mr. Lindheimer has discovered two undescribed species of *Portulaca* in Western Texas. As these plants are so difficult to preserve and so unsightly when dried, he did not collect specimens for distribution; but from his seeds both were raised by me last season and prove very remarkable plants, one from its near alliance with *Portulaca oleracea*, the other from its great difference from that species. I arrange the species of our flora (all of them annuals) in the following manner.

PORTULACA.

* *Spathulatæ:* glaberrimæ; caule tereti; foliis spathulatis obovatis; sepalis alato-carinatis cum operculo capsulæ maturæ deciduis; petalis flavis emarginatis s. bilobis; capsulæ annulo circulari tumido.

1. P. OLERACEA, L.: foliis obovatis spathulatis apice rotundatis; alabastro compresso ovato acuto; sepalis carinatis; staminibus 7 – 9; stigmatibus 5 stylum brevem superantibus; seminibus minoribus minute sub lente verruculosis nigris. — St. Louis, very common; flowers open in direct sunshine between 9 and 10 o'clock, A. M. August.

2. P. RETUSA (*n. sp.*): foliis cuneatis retusis, seu *emarginatis;* alabastro compresso orbiculato obtuso; sepalis late carinato-alatis; staminibus sub – 15 (17 - 19, Lindh., in plantis parvulis 7 – 10); stigmatibus 3 – 4 stylum æquantibus vel eo brevioribus; seminibus majoribus sub lente echinato-tuberculatis nigricantibus. — Granite region of the Liano in Western Texas. Flowers open in direct sunshine between 8½ and 9½ A. M. (in St. Louis, in August), always before the common species. — Distinguished from the nearly allied *P. oleracea* by the broader retuse leaves, and broader calyx; by the larger, more distinctly tuberculated, somewhat paler seeds, much larger style, and shorter and fewer stigmata. Number of stamina variable. In large specimens (bushes several feet in diameter, stems at base 6 – 7 lines thick, prostrate or ascending); the number counted was 15. Stigmata almost invariably 4, rarely 3.

** *Lanceolatæ:* glaberrimæ; caule angulato; foliis superioribus lanceolatis; sepalis vix carinatis post anthesin deciduis; petalis plerumque versicoloribus acutiusculis; capsulæ ala circulari lata ex calycis basi aucta.

3. P. LANCEOLATA (*n. sp.*): *sub*-erecta; foliis inferioribus spathulatis obtusis, superioribus lanceolatis acutis; petalis obovatis s. oblanceolatis acutiusculis s. cuspidatis; staminibus 7 – 27; stigmatibus 3 - 6; capsula turbinata versus apicem ala circulari lata cincta; seminibus majoribus echinato-tuberculatis cinereis.

α. VERSICOLOR; petalis majoribus obovatis rubris basi flavis; staminibus 12 – 24; stigmatibus 5 – 6 linearibus; capsulæ ala orbiculari plana.

β. MINOR; petalis minoribus oblanceolatis sæpe totis flavidis rarius apice rubellis; staminibus 7 - 12; stigmatibus 3 – 4 ovato-oblongis; capsulæ ala subpentagona undulata.

Granite region of the Liano, in Western Texas. — Stems in smaller plants a few inches high, erect, with erect branches; in larger specimens a foot or more high, as-

LINACEÆ.

† LINUM BOOTTII, *Planchon in Lond. Jour. Bot.* 7, p. 475. Upper Pierdenales, sparsely in sandy prairies.—The specimen is entirely in fruit, and has lost nearly all its leaves. Some remarks on this species will be found under No. 581.

337. L. BOOTTII, γ. RUPESTRE; caulibus gracilentis; foliis lineari-subulatis; sepalis paulo latioribus; capsulis minoribus. — L. rupestre, *Lindheimer in sched.* New Braunfels, with Cereus cæspitosus, growing sparsely on rocky soil or in crevices of naked rocks. May. — Stems several, from a firm, probably not really perennial root, very strict and slender, a foot or more high. Petals three or four times the length of thelanceolate-ovate, cuspidate, and glandular-ciliate sepals.

338. L. MULTICAULE, *Hook. in Torr. & Gr. Fl.* 1. p. 678; *Planchon in Lond. Jour. Bot.* 7, p. 185. Upper Pierdenales; socially in naked, clayey places in open oak woods. October; mostly in fruit. Flowers small, yellow. Styles united almost to the summit. Branches clothed with the minute lanceolate-subulate leaves quite up to the flower; the

cending, very much branched. Leaves ½ – 1 inch long, 1 – 3 lines wide. Flowers 4 – 6 lines in diameter, very pretty in the larger forms, open from 8 – 9 o'clock, A. M. (St. Louis, August); earlier than any other species. Capsule with the wing, which is formed by the enlarged base of the deciduous calyx, 2 – 2½ lines in diameter. — The seeds of both forms are absolutely identical, so that the difference in the number of stamina and stigmata, and in the size and color of the flower, cannot constitute them distinct species, as Mr. Lindheimer suggests. He adds that the leaves of α have an acidulous, and those of β an insipid, mucilaginous taste.

* * * *Teretifoliæ:* ad axillæ pilosæ; caule tereti; foliis plus minus teretibus, basi paulo productis; sepalis membranaceis ecarinatis cum operculo capsulæ maturæ deciduis; petalis violaceis; capsulæ margine circulari tumido.

4. P. PILOSA, L.: sepalis lineari-oblongis, petalis ovato-oblongis obtusis retusis s. emarginatis duplo brevioribus; staminibus 15 – 25 stigmatibus 5 – 6 subæquantibus; seminibus minutis nigris opacis minute tuberculatis. Texas, New Mexico, Mexico, etc. — Flowers open from 9 - 11 or 12 o'clock in bright sunshine, 4 – 5 lines in diameter: stigmata glandular, hairy on the margins only, purple.

5. P. GILLIESII, *Hook.:* sepalis orbiculato-ovatis petalis orbiculato-obcordatis ter quaterve brevioribus; staminibus numerosissimis (60) stigmatibus sub-5 exsertis longe brevioribus; seminibus paulo majoribus tuberculatis cinereis nitentibus.—Common in cultivation, and here and there almost naturalized; originally from Chili. Flowers 20 – 24 lines in diameter, open from 8 or 9 to 2 or 3 P. M. in sunshine. Stigmata glandular, hairy on the margins and upper surface, yellowish or greenish.

margins of the latter aculeolate-ciliate, or in Lindheimer's specimens nearly smooth and naked. It is probably only an annual, as likewise the next. Mixed with this, in the distribution, and probably forming the whole in many sets, are fruiting specimens with the upper leaves sparser and the tips of the branches naked, like a short peduncle. These belong to the following species, if indeed it be different, and to the New Braunfels locality there cited.

339. L. HUDSONIOIDES, *Planchon l. c.* p. 186. New Braunfels, growing in dense patches, on dry soil, with a rocky substratum, in naked places in the prairies; May; in fruit; (distributed under No. 338). In clayey soil, Agua Dulce on the Matagorda Bay; February, in flower. — The leaves are less approximated and less squamous than in the preceding; the uppermost sparse on the branches, so that the flower, and especially the fruit, is raised on a manifest peduncle, sometimes of more than half an inch in length. The capsules and the flowers are larger; the yellow petals nearly five lines in length. But it too closely resembles *L. multicaule*, of which it is perhaps only a variety.

(581.) LINUM BERLANDIERI (sphalm. *Berendieri*), *Hook. Bot. Mag.* t. 3480; *Engelm. & Gr. Pl. Lindh.* p. 5; *Gr. Pl. Fendl.* p. 25, No. 84 (non. 85); *Planchon in Lond. Jour. Bot.* 7, p. 473; *Scheele in Linnæa*, 21, p. 596. L. rigidum, β. Berendieri, *Torr. & Gr. Fl.* 1. p. 204. Stony, dry prairies, near New Braunfels. May. — Except in the larger size of the flowers, and the laxer leaves, this species is hard to distinguish from *L. rigidum*. Both, I believe, are *annuals*; but, as they flower through a great part of the year, the root hardens, and the base often shows the vestiges of earlier stems, which have perished; thus giving it somewhat the appearance of a perennial. The styles are united either for two-thirds of their length, or almost to the apex. One of Lindheimer's specimens in my set (gathered in 1846) not indistinctly shows small stipular glands; while that of the Coll. 1847–8 does not. These glands are equally visible in some of the

specimens of No. 85, *Pl. Fendl.*, which I should now refer to L. rigidum, *Pursh.* I believe that I have also noticed them in L. Virginianum; but they do not appear in any of the specimens preserved in my herbarium. The localities from the eastern parts of the United States, cited from *Torr. & Gr. Fl. N. Amer.* by Planchon under L. Berlandieri, belong to his L. Boottii, as I suppose does also the whole of what is called L. rigidum in New England, &c. At least this is the case with the plant gathered at New Haven by Oakes, and at Providence by Mr. Olney. The latter is exactly L. Boottii *a. Planchon, l. c.* As to his L. Boottii β. from Texas, by Lindheimer, I fortunately possess a corresponding specimen, supplied by Engelmann subsequently to the distribution of Lindheimer's former collections, and named "L. rigidum" on a ticket bearing the printed number 118, which number has been erased with the pen. This explains its occurrence in the same way in *herb. Hooker.* The root is annual. If it be a distinct species, as is most likely, still it appears, from what has already been stated, the stipular glands cannot be entirely relied upon for a character. Planchon has omitted to notice the more or less glanduliferous-ciliate margins of the sepals, which are conspicuous in most cases, and caused the plant to be referred in the Flora of North America, &c. to L. rigidum, to which it is very nearly related.

GERANIACEÆ.

340. Erodium Texanum (*Gr. Gen. Ill.* 2, p. 130, t. 150): bienne v. annuum; caulibus diffusis cinereo-puberulis; foliis glabriusculis cordatis crenatis plerumque 3-lobatis, superiorum lobis lateralibus bifidis, terminali 3–5-fido; pedunculis 3-floris; floribus vernalibus petalis purpureis sepala scarioso-marginata subulato-mucronata duplo superantibus, serotinis apetalis; pedicellis calycibusque pube appressa canescentibus eglandulosis; carpellis hirsutis lineari-clavatis basi pungentibus. — Small thickets in prairies above Victoria; and in patches in rocky soil at New Braunfels; March, April. Also

the apetalous state (340, in Coll. 1847–8); the particular locality not given. Mr. Wright also gathered it in Texas, where it appears to abound. — From the Californium E. macrophyllum, *Hook. & Arn.* (the leaves of which are often less than an inch in diameter,) which it most resembles, this species is distinguished by its smaller flowers, more deeply lobed leaves, more slender carpels, and the close cinereous pubescence of the pedicels and calyx, which are destitute of glandular hairs.

OXALIDACEÆ.

341. Oxalis vespertilionis, *Torr. & Gr. Fl.* 1. p. 679. Prairies, Upper Pierdenales. October. Also gathered in Western Texas by Mr. Wright.

ZYGOPHYLLACEÆ.

342. Kallstrœmia maxima, *Torr. & Gr. Fl.* 1. p. 213; *Gr. Gen. Ill.* 2, t. 146. Prostrate in clayey soil, near San Antonio. September.

(582.) Guaiacum angustifolium, *Engelm. in Wisliz. Memoir, Appx.* p. 113; *Gr. Gen. Ill.* 2, p. 123 (subgen.? Guaiacidium), t. 149. Western Texas, in fruit; the station not given.

RUTACEÆ.

343. Rutosma Texana, *Gr. Gen. Ill.* 2, p. 143, t. 155. Stony prairies, with Cactaceæ, Upper Guadaloupe. March. Also detected by Mr. Wright in Texas, and by Dr. Gregg at Monterey. — Remarkable as the sole representative of the proper Rutaceæ in America.

ANACARDIACEÆ.

344. Rhus Copallina, *Linn.* var. leucantha, *DC.*: caule 10-pedali; foliis lanceolatis; floribus albis. R. leucantha, *Jacq.* Rocky precipices, New Braunfels. July.

345. R. Copallina, *Linn.* var. lanceolata: foliis lanceolatis subfalcatis sæpe elongatis integerrimis vel subserratis;

floribus flavis (pl. submasc. subfœm. fruct.) Rocky soil and high prairies, New Braunfels. July. Plant from two to five feet high.

346. R. Toxicodendron, *Linn.; Torr. & Gr. Fl.* 1. p. 218. Thickets and stony prairies, New Braunfels. May, in flower: September, in fruit. "Erect, not climbing." — This is the Rhus verrucosa, *Scheele in Linnæa* 21, p. 592, which is compared only with R. aromatica! The "Verrucæ magnæ subrotundæ atropurpureæ lucidæ," of the lower surface of the leaves, which suggested the name, are merely exudations of resinous juice caused by the puncture of insects on some leaves only, as Dr. Engelmann has pointed out.

† R. Toxicodendron, *Linn.* var. foliis ramulisque molliter pubentibus. Thickets, New Braunfels.

347. R. (Lobadium) trilobata, *Nutt. in Torr. & Gray, Fl.* 1, p. 219. Rocky soil, margin of high prairies, New Braunfels; March (in flower); June (in fruit). A slender, much branched shrub, two to five feet high.

348. R. virens (*Lindheimer, Mss.*): glabella; foliis sempervirentibus 3–4-jugis cum impari, rachide nuda; foliolis ovatis oblongisve obtusis v. obtusiuscule acuminatis margine subrevolutis integerrimis coriaceis supra nitidis subtus pallidis sub lente minutim tomentulosis; floribus albidis thyrsoideo-paniculatis; paniculis axillaribus folio brevioribus; drupa rubra hirsuta, putamine lenticulari lævi. — Rocky soil, in open places, in Cedar woods, New Braunfels, &c. March; in fruit, August. Mr. Wright sends the same species from Western Texas; and Dr. Coulter collected it at Zimapan, Mexico. A well marked species, of the section Sumac. Leaflets an inch or rather more in length, smooth, except under a lens, soft to the touch, shining above, thick and rigidly coriaceous.

MALVACEÆ.

† Callirrhoë involucrata, *Gray, Pl. Fendl.* p. 14, & *Gen. Ill.* 2, p. 53, t. 117. Malva involucrata, *Torr. & Gray, Fl.* 1, p. 226. Oak openings, on the Pierdenales. June.

(584.) C. DIGITATA, *Nutt. in Jour. Acad. Philad.* 2, p. 181; *Gray, Pl. Fendl. l. c., & Gen. Ill.* 21, p. 53. Nuttallia digitata, *Bart. Fl. N. Amer.* 2, t. 63, *Hook. Exot. Fl.* 3, t. 171. Nuttallia cordata, *Lindl. Bot. Reg.* t. 1938. Prairies on the Pierdenales, at the margin of woods. May, June. Also gathered by Mr. Wright. "Root edible, more pleasant than that of Psoralea esculenta," *Lindh.* — One of the most showy species of this handsome genus; the petals, over an inch in length, are beautifully fringed at the summit. The radical leaves are very various.

349. C. PEDATA, *Gray, Pl. Fendl.* p. 17, (excl. syn. Nuttallia digitata, *Bart.*) & *Gen. Ill.* 2, p. 53, t. 118. Nuttallia pedata, *Nutt. in Hook. Exot. Fl.* 3, t. 172. Dry prairies and margin of thickets, near Victoria, New Braunfels, and on the Cibolo, &c. Also abundantly gathered by Mr. Wright. February, April. — In cultivation, this handsome species produces its deep cherry-red blossoms through the whole season, and when supported attains the height of five or six feet. Although it has been confused with the preceding, it is totally distinct from it. It has much smaller flowers, leafy stems, more incised foliage, and a slender, annual or biennial root.

350. M. WRIGHTII, *Gray, Pl. Fendl.* p. 21, & *Gen. Ill.* 2, p. 60, t. 122. Malva aurantiaca, *Scheele, in Linnæa*, 21, p. 469. Muskit flats, in black and heavy prairie soil. New Braunfels. July. — The stems are rigid, from a more or less ligneous base; the rather large, golden yellow flowers open in the afternoon. The fructiferous calyx is somewhat enlarged, and expanded, and tinged with brownish-red; the carpels in the living plant (raised in the Cambridge Botanic Garden,) are more deeply tinged of the same color. — The characters of a new species, allied to M. coccineum, are subjoined.[1]

[1] MALVASTRUM PEDATIFIDUM (sp. nov.): caulibus e radice perenni diffusis gracilibus ramosis; foliis tripartitis profunde trifidisve pilis stellatis parce hirsutis, segmentis lateralibus bifidis, terminali subtrilobo, omnibus subpinnatifido-incisis, lobulis dentibusve patentibus; stipulis subulatis; floribus sparsis axillaribus et secus ramulos laxe racemosis; bracteolis 3 setaceis calyce subduplo brevioribus; carpellis muticis, rostro

351. Malvastrum carpinifolium, *Gray, Pl. Fendl.* p. 22. In sterile soil, New Braunfels, &c. August. — To the synonyms cited in the work above-cited, I have to add that of Malva Lindheimeriana, *Scheele in Linnæa,* 21, (1848,) p. 470. The flowers open merely during a few hours of the brightest sunshine.

352. Pavonia Wrightii, *Gray, Gen. Ill.* 2, p. 76, t. 130. P. lasiopetala, *Scheele in Linnæa,* 21, p. 470. Rocky soil in Cedar woods, New Braunfels. Also gathered in Western Texas, by Mr. Wright, and near Monterey, in Northern Mexico, by Dr. Edwards and Major Eaton. — A low, shrubby species, with handsome, rose-colored flowers, which are larger in the wild than in our cultivated plant, from which the figure in the Genera Illustrata was made. The seeds are glabrous, except a little pubescence at the chalaza; and in some other respects, also, the species is not very well characterized by Scheele. His name, from its priority in publication, should probably be adopted, although so badly chosen; for the petals, at most sparingly stellate-pubescent externally, are often nearly or quite glabrous.

353. A. Texense (*Torr. & Gray, Fl.* 1, p. 231): tomento minuto molli undique velutino-canescens; caule (2–4-pedali) paniculato; foliis cordatis acutis vel subacuminatis serratis supra viridulis, ramealibus gradatim minoribus; pedunculis inferioribus petiolum subæquantibus, summis folio longioribus; corolla lutea; capsula ovoidea obtusa cinerea 8-loculari apice breviter 8-loba calyce 5-fido demum reflexo multum longiore; carpellis erectis obtusiusculis muticis 3-spermis. — Prairies, &c. in hard and dry soil, New Braunfels. August, September. Apparently common throughout Texas, and to Monterey, in Northern Mexico, where it was gathered by Dr.

brevi complanato membranaceo inflexis. — On the Rio Grande, Texas, in dry soil. Cultivated in the Cambridge Botanic Garden, it flowers through the summer. Stems a foot or less in height, much more slender than in M. coccineum; the flowers smaller and paler (between a buff and a brick-color.) The leaves are not canescent, but green and sparsely stellate-hirsute, and their segments incised or almost pinnatifid; the lobes are tipped with a deciduous mucro or short seta.

Gregg. The expanded corolla is two thirds of an inch in diameter. The larger cauline leaves are from three to four inches long, on petioles of half that length. They are described in the *Flora of North America,* from the branches only. I do not know the A. Nuttallii.[1]

354. Abutilon holosericeum, *Scheele in Linnæa,* 21, p. 471. A. velutinum, *Gray, Gen. Ill.* 2, p. 67, t. 125. Rocky soil, along the margin of thickets, New Braunfels, &c. August, September. Also gathered by Mr. Wright in Western and Southern Texas. — Stem three to six feet high; the larger leaves nearly a foot in diameter, on petioles six to eight inches long, very seldom at all lobed. The deep orange-yellow corolla is over an inch in breadth. The details of the fruit, &c. are well delineated in the plate cited above. The anthers are reniform, in the ordinary manner, not three-lobed, as described by Scheele. The young leaves are quite white; the older and larger ones greener. The root is said to be "ligneous and perennial?" in the wild plant. In cultivation it is an annual.

† Sphæralcea Lindheimeri (sp. nov.): lanoso-tomentosa; caulibus decumbentibus basi ut videtur suffruticosis; ramis floridis assurgentibus; foliis cordatis sæpius rotundatis grosse crenatis indivisis; pedunculis petiolo longioribus; bracteolis involucelli 3 setaceis calycis lobis ovato-lanceolatis acuminatis dimidio brevioribus; corolla rosea. — Victoria, on the lower Guadaloupe; margin of thickets on the prairie.

[1] Near the southwestern borders of Texas, Mr. Wright obtained specimens of the subjoined species, namely: —

Abutilon Wrightii (sp. nov.): caulibus decumbentibus ramosis viscoso-pubescentibus et pilis gracillimis patentibus villosis; foliis ovato-cordatis obtusiusculis argute dentatis supra viridulis scabrido-velutinis subtus mollissime niveo-tomentosis; stipulis subulatis caducis; pedunculis unifloris petiolum æquantibus vel superioribus folium superantibus; calyce tomentoso 5-partito, laciniis sensim acuminatissimis corollam auream subæquantibus; capsula tomentulosa calyci æquilonga, e carpellis 7 apice subulato-rostratis 3-spermis. — On the Rio Grande and the Seco, *Mr. Charles Wright.* — Stems one or two feet in length; the leaves from one third to an inch and a half long. Calyx nearly as long as the peduncle. The golden-yellow corolla is over an inch in diameter when fully expanded. Capsule half an inch long, not inflated, the subulate beaks little diverging.

February; just beginning to blossom. Stems a foot long. Leaves one or two inches broad; the soft pubescence appearing as if deciduous with age. Calyx deeply 5-cleft; the lobes half an inch long. The expanded corolla about two inches in diameter. Stamineal column stellate-hairy. Styles 17–18, clavate at the tip; the stigmas truncate rather than capitate. Ovules two or three in each cell. Fruit not seen.

355. SIDA FILICAULIS, *Torr. & Gray, Fl.* 1, p. 232. S. filiformis, *Moricand, Pl. Nouv. Amer.* p. 38, t. 25. High and dry prairies and sunny declivities, New Braunfels, &c. June, August. — Prostrate, in patches, producing very numerous slender and branching stems from a perennial and somewhat ligneous root. These, when young, are beset with long, spreading hairs, which are so slender that they often escape notice, and are also deciduous from the older stems. Hence our Texan plant is doubtless the S. filiformis of Moricand, gathered at Tampico by Berlandier. Moricand's name is a little the earlier published; but it appears from Steudel that there is a prior S. filiformis of Jacquin, which has been overlooked.[1]

(583.) S. PHYSOCALYX (sp. nov.): caulibus e radice carnosa crassa plurimis decumbentibus ramosis strigosis; foliis carnosulis ovato-oblongis crenato-dentatis basi 5–7-nerviis

[1] Sida anomala β. Mexicana, *Moricand, l. c.* p. 36, t. 24, also from Tampico, is S. fasciculata, *Torr. & Gray, Fl.* 1, p. 231, which has recently been gathered in Western Texas, by Mr. Wright. The corolla, in dried specimens, is pink or rose-color, as is also said by Moricand, and the short, tufted stems spring from a stout perennial root. Another species, indicated by Dr. Engelmann, I know only from a fragment, namely: —

SIDA HETEROCARPA, *Engelm. Mss.*: "stellato-pubescens; caule erecto ramoso; foliis basi subcordatis obtusis crenato-dentatis, inferioribus lanceolatis, superioribus linearibus; tuberculo subbasi petioli subspinoso; petiolis brevibus stipulas setaceas et pedicellas solitarias s. fasciculatas superantibus; carpellis 5 nigris divaricato-birostratis apice pubescentibus latere tenuiter rugulosis, dorso membrana tenui evanescente clausis.—Road-sides, waste places, Houston, Texas, with S. spinosa. Annual? Flowers in August and September. Distinguished from S. spinosa by the narrower dentate-crenate (not serrate) leaves, and smaller black (not light brown) carpels, rugulose (not lacunose-reticulated) on the sides, with a prominent point on the back, broader, shorter, more divaricate, not erect beaks. The seed escapes through the back, not through the regular opening at the top."

subcordatis petiolo subduplo longioribus supra pilis simplicibus subtus pilis 3–5-partitis appressis parce strigosis, infimis rotundatis, summis sublanceolatis acutis; stipulis subulatis; pedunculis axillaribus unifloris petiolo brevioribus fructiferis nutantibus; calyce 5-partito membranaceo inflato 5-alato clauso pedunculum adæquantibus, segmentis late ovatis quasi cordatis; corolla flavida vix exserta; ovario carnoso arcte depresso 10-lobo pruinoso demum in carpella 10 rotundata intus subrostrato-producta mutica semini conformia nitida minute reticulata calyce maximo vesicario inclusa secedentibus. — On the Liano. A well-marked species, apparently allied to S. physalodes, *Presl;* the calyx strikingly inflated, like a Physalis; the corolla inconspicuous and opening only for a short time in direct sunshine. It has been cultivated during the past summer in the Botanic Garden, and it forms a conical and fleshy perennial root. Specimens have been gathered by Mr. Wright, and others in Southern Texas, by Wislizenus, south of El Paso del Norte, and by Dr. Gregg in Northern Mexico.[1]

[1] Three other undescribed Texan species have been detected by Mr. Wright namely: —

Sida tragiæfolia (sp. nov.): humilis; caulibus (e radice perenni?) suberectis petiolisque pube stellata subglutinosa velutinis setisque patentibus gracillimis hispidis; foliis ovato-oblongis angulato-cordatis grosse dentatis penninerviis basi 5–7-nervatis supra parce subtus molliter pubescentibus petiolo gracili (pollicari) vix duplo longioribus, superioribus acutis; stipulis setaceis; pedunculis axillaribus unifloris petiolum subæquantibus; corolla supra calycem villosulum paulo excedente; carpellis 10 glabriusculis apice obtuso bipartibilibus summo dorso bicorniculatis. — Raised in the Botanic Garden, Cambridge, from seeds gathered in southern Texas by *Mr. Charles Wright.* The foliage is not unlike that of Tragia urticæfolia. Corolla fugacious, half an inch in diameter. Carpels short, beakless, bimucronate or bicorniculate on the back near the apex.

S. filipes (sp. nov.): furfuraceo-canescens; caule erecto paniculato gracili: foliis brevissime petiolatis lanceolatis basi cordatis dentato-serratis obtusiusculis supra velutino-pubescentibus subtus ramulisque cano-tomentosis nunc fulvis vel ferrugineis; stipulis setaceis petiolum excedentibus; pedunculis unifloris capillaribus (2–3-pollicaribus) foliis longioribus paulo sub flore pendulo articulatis; corolla (purpurea?) calycem subduplo superante; carpellis 7 reticulato-rugosis muticis superne pubescentibus dorso canaliculatis bivalvibus. — On hills above Austin, Texas, *Mr. Charles Wright.* Also near Monterey, Mexico, *Dr. Edwards* and *Major Eaton* (in *Herb. Torrey*). — Base of the slender stems wanting, but apparently it is entirely herbaceous, of two or three feet in height. The leaves are from one and an half to two

356. Melochia pyramidata, *Linn.; Torr. & Gray, Fl.* 1. p. 683; *Gray, Gen. Ill.* 2. t. 134. Upper Guadaloupe, on rocky soil. August.

357. Hermannia Texana, *Gray, Gen. Ill.* 2. p. 88. t. 135. Rocks, on the Upper Guadaloupe; in flower; and in high rocky prairies on the Salado River; in fruit, October, (585.) — This interesting accession to our flora has also been found on the Rio Grande by Mr. Wright, and in Northern Mexico, by Dr. Gregg. Since the figure above cited was published, the plant has flowered in the Cambridge Botanic Garden. I must remark that the cinnabar-colored corolla is convolute and erect, not at all spreading at any period, as is represented in the figure, which was made from a dried specimen. The plant is suffruticose, with a thickened ligneous root.

VITACEÆ.

358. V. rupestris, *Scheele in Linnæa*, 21. p. 591. V. populifolia, *Lindh. ined.* Dry, rocky bed of the Cibolo, Upper Guadaloupe, and other streams; also in rocky prairies on the Pierdenales; flowering in May; the fruit ripe in July, August, and September. — Like his other species, this is by

inches long, half an inch or less in width, and much like those of Sphæralcea angustifolia. The peduncles are remarkably long and slender, and curved towards the apex, near the articulation, so that the flower and fruit are pendulous. The calyx is 5-cleft to the middle; the lobes rather obtuse. The expanded corolla is only about four lines in diameter. It is said by Mr. Wright to be "blue;" in the dried specimens it is dark purple. — The species is probably allied to S. venusta, *Schlecht.*

S. cuneifolia (*sp. nov.*): cano-tomentosa, humilis; caulibus e basi fruticulosa assurgentibus ramosissimis; foliis parvulis rotundato-cuneiformibus flabellato 3–5-nerviis crenato-dentatis repandisve utrinque concoloribus; stipulis linearibus petiolum subæquantibus; floribus (flavis) brevissime pedunculatis folio brevioribus; carpellis 5 pubescentibus membranaceis turgidis apice inter rostra brevia mollia demum bivalvibus; semine globoso. — In subsaline soil, Texas, about thirty-five miles north-east of Eagle Pass, on the Rio Grande, September, *Mr. Charles Wright.* — A well-marked, low, procumbent species, in foliage and habit not unlike a Hermannia. The soft, downy leaves are only about half an inch in length and breadth, on petioles of three or four lines long; the flowers are solitary, or often clustered in the axils, and sometimes scarcely exceed the petioles. The yellow corolla is twice the length of the calyx, and is half an inch in diameter when expanded. The ovate carpels are membranaceous, slightly inflated; the seed is proportionally large and spherical, as in Abutilon, with the micropyle somewhat rostellate.

no means well characterized by Mr. Scheele. According to Lindheimer it is called *Mountain Grape*, and covers large tracts of rocky soil. It does not climb, but the stems are upright, and only two or three feet high. The branches are small, and the berries, of the size of peas only, are black, very sweet, and the most grateful as well as the earliest ripened grape of Texas. Dr. Engelmann informs me that he met with the same species in Western Arkansas, growing in similar situations. Also that a specimen exists in Michaux's Herbarium, on the same sheet with *V. riparia.* The leaves are somewhat glaucous, and in appearance between those of *V. riparia* and *V. vulpina*, but much smaller than in either.

359. V. æstivalis, *Michx. Fl.* 2. p. 230: var. tomento albo, nec fulvo. Shady banks of streams, New Braunfels, &c.; flowering in May; the fruit ripe in August. "Climbing high trees. Berries of the size of peas, in large bunches, very black; the taste vinous and pleasant. Flowers very odorous." *Lindh.* — Under the name of "V. candicans, (*n. sp.*,) *Engelm. ined.*, I have from Lindheimer, as also from Mr. Wright, Texan specimens of what appears to be a variety of V. Californica, *Benth.*, with the leaves somewhat less dentate and more densely tomentose underneath.

† Vitis (Cissus) incisa, *Nutt. in Torr. & Gray, Fl.* 1. p. 243. New Braunfels, climbing on Muskit trees. July–September. — Leaves thick and remarkably fleshy.

† V. vulpina, *Linn.; Torr. & Gray, l. c.* V. rotundifolia, *Michx. Fl.* 2. p. 231. New Braunfels. April.

ACERACEÆ.

360. Negundo aceroides, *Mœnch.;* foliis adultis molliter pubescentibus. New Braunfels; and banks of the Comale. March, in flower. August, in fruit.

MALPIGHIACEÆ.

361. Galphimia linifolia (*Gray, Gen. Ill.* 2. p. 196. t. 173): humilis; caulibus gracilibus e basi pubescente herba-

ceis glabellis; foliis glabris glaucescentibus lanceolatis vel linearibus subsessilibus (infimis sæpe oblongis vel ellipticis in petiolum angustatis) juxta basim utrinque uniglandulosis repando-subdenticulatis vel integerrimis; racemis laxis; pedicellis basi articulatis; petalis flavis cito rubris. — Rocky hills and prairies of the Upper Guadaloupe. July — September. Also found by Mr. Wright; and in Northern Mexico by Dr. Edwards and Major Eaton. Stems from one to two feet in height.[1]

SAPINDACEÆ.

362. ÆSCULUS PAVIA, β. DISCOLOR, *Torr. & Gr. Fl.* 1. p. 252. Pavia discolor, *Pursh.* Banks of the Comale Creek, March. "Shrub 6 – 10 feet high: flowers red or yellow."

363. UNGNADIA SPECIOSA, *Endl. Atakt. Bot.* t. 36, & *Nov. Stirp. Dec.* p. 86; *Torr. & Gray, Fl.* 1. p. 684; *Gray, Gen. Ill.* 2. p. 211, t. 178, 179. U. heterophylla, *Scheele in Linnæa*, 21. p. 589; sphalm. pro U. heptaphylla, *Scheele, l. c.* 22. p. 352. In bottom-woods, New Braunfels. March; sometimes flowering again in August. "Shrub 3 to 20 feet high, with many long stems, 1 to 3 inches thick, branching only at the top. Fruit sweet and pleasant, but emetic." *Lindh.* Its popular name is *Spanish Buckeye.* — "The fertile flowers and the fruit, although for several years known to us, have not until now been illustrated or described, except by Adolf Scheele, who has published a description, from *Lindheimer's* specimens, in the *Linnæa,* during the past year. The flowers

[1] On the southwestern border of Texas, Mr. Wright has detected a Malpighiaceous plant, which proves to be a third species of Aspicarpa, namely: —

ASPICARPA HYSSOPIFOLIA (*sp. nov.*): caulibus e radice lignescente plurimis erectis (6 – 12-pollic.); foliis lineari-lanceolatis basi rotundatis subcordatisve sessilibus; pedicellis axillaribus solitariis; petalis rotundatis eximie crispato-fimbriatis. — On the Rio Grande and Rio Seco, Texas, *Mr. Charles Wright.* — Leaves scarcely an inch long, one to two lines wide; the midrib and margins hispid-ciliate. Flowers about one third the size of those of A. Hartwegiana; the petaliferous ones scattered in the axils (not umbellate at the summit of the stem), and fructiferous, either two or three carpels ripening. These are much as in A. Hartwegiana, but smaller, more upright and acute, deeply umbilicate at the insertion. Fruit from the abnormal, apetalous flowers not seen.

which Endlicher happened to examine were pentapetalous, which is not the more usual case; and he erroneously states the plant to form a large tree, whereas it is commonly a slender shrub, of five or ten feet in height, or at most a small tree. Misled by these discrepancies, and by the differences of the two kinds of flowers, and, it would seem from his description, happening to possess *tetrasepalous* as well as tetrapetalous flowers (although there are five sepals in all my Lindheimerian and other specimens,) Mr. Scheele has wrongly introduced a second species, under the name of U. heterophylla. The leaflets vary from five, or even three, on the earlier leaves, to seven." *Gen. Ill. l. c.* — In seedling plants, raised in the Cambridge Botanic Garden, I have noticed a lusus of the earliest leaves, in which the leaflets are confluent.

(586.) U. SPECIOSA, *Endl.* Finer specimens of both sexes; from New Braunfels.

(587.) SAPINDUS MARGINATUS, *Willd.; Torr. & Gray, Fl.* 1. p. 255; *Gray, Gen. Ill.* 2. t. 180. New Braunfels. June, (in flower.)

RHAMNACEÆ.

364. ZIZYPHUS OBTUSIFOLIA, *Gray, Gen. Ill.* 2. p. 170. t. 163. Rhamnus obtusifolius, *Hook. in Torr. & Gray, Fl.* 1. p. 685. Paliurus Texanus, *Scheele in Linnæa,* 21. p. 580. Bottom woods of Comale Creek, New Braunfels, &c.; common. A shrub or small tree, with slender shoots and greenish-white bark; several times flowering between March and September. No. (588) is the same plant in flower, and in ripe fruit, the fruit ripening the season after flowering.[1]

[1] Another species, gathered by Dr. Gregg between Matamoros and Mapimi, may be thus characterized: —

ZIZYPHUS LYCIOIDES (*sp. nov.*): glabrata; ramis valde spinosis; foliis oblongo-linearibus parvis integerrimis coriaceis; pedunculis brevissimis 3–5-floris; drupa subglobosa monosperma. — The sharp and straight thorns are from one to two inches in length: the specimen shows no stipular spines. Leaves half an inch long, one or two lines wide, obtuse. Fruit, of the size of that of the Buckthorn, said by Dr. Gregg to be black and edible.

365. Colubrina Texensis: caule ramosissimo, ramulis divaricatis cinereis; foliis elliptico-cuneatis oblongisve glanduloso-denticulatis breviter petiolatis alternis plerumque in nodos fasciculatis supra pubescentibus nunc glabratis subtus sericeo-villosis fulvis penniverviis basi trinervatis; pedunculis fasciculatis paucis petiolo longioribus calyceque (laciniis patentibus) villosis. — Rhamnus? Texensis, *Torr. & Gray, Fl.* 1. p. 263. — Prairies and borders of woods on the Guadaloupe and Comale. (Also communicated by *Mr. Wright.*) Flowers in May; fruits in June. — Shrub 2 to 5 feet high, rigid. Leaves three fourths of an inch long. Pedicels two to four together from the centre of the cluster of leaves, two or three lines long in flower, in fruit becoming half an inch or more in length. Calyx-tube adherent to the ovary and filled with the broad annular disk; the lobes widely spreading, broadly triangular-ovate, nearly herbaceous. Petals unguiculate, shorter than the subulate-filiform filaments, scarcely equalling the calyx. Styles three, sometimes four, united at the base, stigmatose on the inner face above. Ovary immersed in the adherent disk. Fruit dry and capsular at maturity, tricoccous, somewhat three-lobed, globular, girt at the base by the persistent and adherent base of the calyx, three-seeded. Seeds lenticular, plano-convex, shining. Cotyledons plane; albumen very thin. This shrub, of which we at length are provided with complete specimens, has nearly the flowers of a Zizyphus, but the fruit of a Ceanothus. It appears to be a genuine Colubrina.

366. Condalia obovata, *Hook. Ic. Pl.* t. 287; *Torr. & Gray, Fl.* 1. p. 685; *Gray, Gen. Ill.* 2. t. 164. "On slopes, near watercourses; common from Matagorda Bay to New Braunfels. — Shrub, or small tree, sometimes 20 to 30 feet high, with a trunk one foot in diameter. Flowers very sparse. August, September. The wood dyes blue. Called here *Blue-wood* or *Logwood.*" No. (589) is the same plant, in flower and fruit.

† Ceanothus ovalis, *Bigel. Fl. Bost. ed.* 2. p. 92. C. ovatus, *Desf. Arb.* 2. p. 381. Rocky heights, along the Pierdenales and Sabinas. June (in fruit.)

LEGUMINOSÆ.

(590.) Vicia Leavenworthii, *Torr. & Gr. l. c.* W. Texas.

367. Phaseolus retusus, *Benth. Pl. Hartw. No.* 59, p. 11. P. maculatus, *Scheele in Linnæa*, 21. p. 465. On rocky or gravelly soil in the dry bed of the Cibolo River. June, September. "Prostrate; the stems often running for twenty feet." In cultivation it is more or less voluble. The leaflets are thicker in texture and more reticulated than those of *P. perennis*, not acuminate, but obtuse or many of them retuse. They are more dilated at the base than in my specimen of Hartweg's plant, but otherwise, there is little perceptible difference. Mr. Wright met with it all the way to the Rio Grande, and Dr. Wislizenus in Chihuahua.

† P. diversifolius was found on the Liano; and Apios tuberosa and Clitoria Mariana on the Pierdenales.

368. Galactia Texana: procumbens, subvolubilis, cinereo-tomentosa, trifoliolata; foliolis ovalibus retusis setaceo-mucronatis supra cinereo-puberulis subtus sericeo-canescentibus; racemis paucifloris folio brevioribus petiolum raro superantibus; legumine eximie falcato sericeo folia excedentibus. — Lablab Texanus, *Scheele in Linnæa*, 21, p. 467. — New Braunfels. August. Root ligneous. Leaflets 1 to 1½ inch long, in appearance intermediate between those of *G. mollis* and *G. canescens*, less whitened beneath than in the latter. Flowers little larger than those of *G. mollis*, with hirsute, more attenuated and longer calyx-lobes. Legumes 2½ inches long, linear, strongly falcate, densely silky, 9–10-seeded. I do not observe the muricate-tuberculate sutures mentioned by Scheele. Seeds oval, chestnut-colored, with a brown hilum, not strophiolate. The species is nearest allied to what I take to be G. mollis, *Michx.* Mr. Scheele, with his usual wisdom, provisionally refers the plant (without fruit) to Lablab!

369. Rhynchosia Texana, *Torr. & Gr. Fl.* 1. p. 687. New Braunfels; prostrate, or climbing over bushes. August. It has the aspect of a Galactia.

370. Galactia canescens, *Benth. Comm. Legum. Gen.* p. 62; *Torr. & Gr. Fl.* 1. p. 288, & p. 687. Heterocarpæa Texana, *Scheele in Linnæa,* 21, p. 467. Rocky soil, New Braunfels. June, September. "Often flowering a second time after the rains in September, as is the case with many other plants." — Stems creeping; many of the racemes becoming subterranean, and bearing globular, membranaceous legumes which are filled by a single large seed; while the legumes which fructify above ground are linear-oblong, canescent, and 4–5-seeded; as is mentioned in the *Fl. N. Amer.* p. 687. On this Mr. Scheele has founded his new genus *Heterocarpæa*, which he thinks is very distinct from any other known!

(591.) G. heterophylla (*sp. nov.*): cano-sericea; caulibus gracilibus e basi suffruticosa decumbentibus; foliolis oblongis subcuneatis obtusis retusisve mucronulatis, aut 3 lateralibus a terminali paulo remotis brevissime petiolulatis, aut in plurimis 4–5, accessoriis cum lateralibus digitatim insertis; racemis brevibus paucifloris; calycis laciniis triangulari-oblongis sericeis corolla multo brevioribus, superiore bidentato; legumine puberulo recto inferne angustato 3–6-spermo. — On the Llano, October. — Remarkable for its prevailingly 4–5-foliolate leaves, although some in each specimen are only 3-foliolate; the additional leaflets are mostly rather smaller than the others, and inserted with the lateral pair. Stems 6 to 20 inches long. Leaflets half an inch long, thickish, silky-canescent, especially underneath, with a closely appressed and silvery pubescence; the veins rather prominent underneath. Stipules subulate: stipels deciduous. Peduncles 1–4-flowered. Corolla nearly half an inch long, fully twice the length of the calyx; the vexillum appears to have been pale yellow! the other petals rose-color. Legume 1½ inches long. Seeds, style, &c. as in the genus to which I refer this in some respects anomalous species.

371. Sesbania macrocarpa, *Muhl.*; *Torr. & Gr. Fl.* 1. p. 293. Banks of Comale Creek. August, September.

(592.) Tephrosia Lindheimeri (*sp. nov.*): caule prostrato nunc adscendente flexuoso ramoso pube brevi tomentuloso; foliolis 7 – 13 late obovatis cuneatisve sæpe retusis mucronulatis subtus præsertim incano-sericeis; stipulis brevibus subulatis; racemis laxe multifloris; lobis calycis subulatis tubo sublongioribus; legumine pube brevi densa velutino. — Muskit prairies, on the Liano. August. (Also gathered by Mr. Wright in Western Texas.) Stems rather stout, 3 or 4 feet long, from a tuberous and ligneous root. Leaflets 8 to 12 or sometimes 18 lines in length, roundish-obovate or broadly cuneiform; the pairs rather distant on the rachis. Raceme 7 – 9 inches long, exceeding the leaves, 20 – 30-flowered. Corolla nearly as large as that of *T. onobrychoides*, over half an inch broad, purple.

372. Psoralea cuspidata, *Pursh. Fl.* 2, p. 741; *Torr. & Gr. Fl.* 1, p. 688. P. cryptocarpa, *Torr. & Gr. l. c.* p. 301. P. Rœmeriana, *Scheele in Linnæa*, 21, p. 463.[1] New Braunfels; sparsely on rocky prairies. May, June. "Flower entirely blue." — The caudex or root often bears a globular tuber, as in *P. esculenta*, &c. The spikes become oblong or cylindrical, and looser in fruit; the bracts are ovate-oblong or obovate, and abruptly cuspidate-acuminate; the calyx is somewhat gibbous, and its lower lobe soon elongated; points in which the species is not quite correctly described in the Flora. The legume is utricular, membranaceous and fragile.

(593.) Psoralea cyphocalyx (*sp. nov.*): striguloso-subcinerea, caulibus e caudice lignescente tuberifero erectis simplicibus; foliis digitatis 3 – 5-foliolatis; foliolis linearibus (majoribus 3-pollicaribus) mucronulatis supra glabratis nigroglandulosis; stipulis subulatis; spicis longiuscule pedunculatis

[1] The Indigofera Lindheimeriana, *Scheele in Linnæa, l. c.* is evidently I. Anil, *L. β. polyphylla, DC.*, which I have from Texas by Mr. Wright (although neither Dr. Engelmann nor I have received it from Mr. Lindheimer,) and also from South Carolina, where, according to Mr. Ravenel it occurs not uncommonly in cultivated fields.

interrupte multifloris fasciculis approximatis; bracteis ovatis acuminatis; calycis tubo valde obliquo postice saccato pedicillum bis terve excedente, lobis lanceolatis acuminatis margine albo-villosis, superioribus ultra dimidium coalitis. — Rocky prairies on the Cibolo and Pierdenales, growing sparsely. May, June (in flower.) — Caudex perpendicular, dilated below the summit into a globular tuber, of nearly an inch in diameter. Stem 2 to 3 feet high, simple, or sparingly paniculate at the summit. Lower petioles nearly as long as the leaflets; the latter 2 or 3 lines wide. Spikes dense, one or two inches long. Flowers apparently pale purple, fully half an inch in length; the pedicels scarcely a line long. Calyx conspicuously glandular; the tube remarkably one-sided, nearly straight on the lower side, but strongly gibbous-saccate or almost calcarate on the upper! The free apices of the nine filaments are very short, all antheriferous; five of them spatulate, the four intermediate triangular and shorter. Ovary glabrous. Fruit not seen.

(594.) P. HYPOGÆA, *Nutt.*, var. SCAPOSA: pedunculis petiolos v. folia æquantibus, $1\frac{1}{2}-2\frac{1}{2}$ unc. longis. — Stony soil, hills on the Pierdenales, near Fredericksburg. April. (Western Texas, *Mr. Charles Wright.*) — Tuber globular or pointed upwards, sending forth a slender caudex, beset with membranous scales. From the Canadian River we have specimens gathered by Mr. Gordon, which are intermediate, as to the length of the peduncle, between the Texan plant and that described by Nuttall.

373. P. FLORIBUNDA, *Nutt. in Torr. & Gray, Fl.* 1. p. 300. Prairies on Comale Creek. In black, clayey soil, New Braunfels, "growing in patches, many stems from the same base, forming a large and dense bush." June. — May not this rather than *P. obtusiloba* (of which Mr. Wright has sent characteristic specimens from Texas,) be the *P. tenuiflora* of Pursh and Nuttall?

374. EYSENHARDTIA AMORPHOIDES, *H. B. K. Nov. Gen. & Sp.* 6. p. 491, t. 592; *Schauer in Linnæa*, 20, p. 747. E.

Drummondii, *Torr. & Gray, Fl.* 1. p. 690, sine descr. E. Texana, *Scheele in Linnæa*, 21. p. 462. — Rocky precipices, Upper Guadaloupe. August. Also gathered by Mr. Wright. "Shrub 4 to 7 feet high." Vexillum barely emarginate. Style little curved at the apex. Ovary with two collateral ovules. Legume linear and arcuate or sabre-shaped, compressed, 5 or 6 lines long, sessile, glandular, dotted, with a single oblong seed pendulous from near the apex, empty below, agreeing with those of *E. amorphoides*, as described by Schauer, and as observed in Mexican specimens of Coulter's Collection. The foliage is rather smoother, the vexillum less notched, and the style less hooked than in the Hartwegian specimens of *E. amorphoides*; but those of Coulter and of Dr. Edwards are intermediate; so that I have no reason to think that the Texan plant is a distinct species. The tenth stamen is scarcely free in either. All the specimens show an oval gland near the apex of the style. — A second species, however, with a 4-ovulate ovary, gathered by Dr. Wislizenus, has been characterized by Dr. Engelmann, as below.[1]

† Amorpha fruticosa, *Linn.*; var. subglabra; foliolis ellipticis retusis supra nitidis. — On a creek near Fredericksburg. June. — One of the forms of this polymorphous species, nearly the same as the A. nana, *Bot. Mag.* t. 2112.

(595.) A. fruticosa, *Linn.*; var. subglabra; foliolis oblongis seu lineari-oblongis. A. Lewisii, *Lodd.! Cat.* — New Braunfels. Like the last, except that the leaflets are narrower and seldom retuse. I know of no constant characters for distinguishing *A. glabra, Desf.*, A. Caroliniana, *Croome*,

[1] "E. spinosa (*n. sp.*): fruticosa; ramis squamosis rachidi spicarum persistente lignosa spinosis; foliis 6–8-jugis; foliolis minutis ovatis acutis adpresse pilosis; spicis paucifloris; calycis obconico-campanulati dentibus triangularibus obtusis inæqualibus; vexillo profunde bilobo; staminibus subdiadelphis; *ovario 4-ovulato* et stylo apice uncinato pilosis. — On Lake Encinillas, north of Chihuahua, *Dr. Wislizenus*; in flower, August and September. — A rough looking, in many respects, remarkable shrub, 2–3 feet high, with black bark. Leaves 4 to 6 or 7 lines long: leaflets 1–1¼ lines long. Spikes an inch long, with a stout persistent rachis: flowers at first white, then rose-colored: uppermost (vexillary) filament shortest and almost free, adhering to the tube only at its base: style strongly hooked." — *Engelm. Mss.*

A. nana, *Nutt.*, *Bot. Mag.*, and A. lævigata, *Nutt.* from A. fruticosa. The A. Rœmeriana, *Scheele in Linnæa*, 21. p. 461, is doubtless a form of A. fruticosa or of A. paniculata.

375. Dalea laxiflora, *Pursh. Fl.* 2. p. 741; *Torr. & Gray, Fl.* 1. p. 307. D. penicillata, *Moric. Pl. Nouv. Amer.* t. 45. Dry and rocky prairies, between the Rio Colorado and Guadaloupe. June, in flower. September, in fruit.

† D. pogonathera, *Gray, Pl. Fendl.* p. 31. On the Liano. October. — Stems a span high, numerous, from a thickish, apparently perennial root. Vexillum violet-purple.

† D. aurea, *Nutt. Gen.* 2. p. 101. Dry prairies, Upper Guadaloupe. June.

† D. nana, *Torr. in Gray, Pl. Fendl.* p. 31. Post-Oak-openings, on the Pierdenales. June. Also gathered by Mr. Wright on the Rio Grande, and by Mr. Gordon on the Arkansas.

376. D. frutescens (*sp. nov.*): glaberrima; caulibus lignescentibus ramosis glandulis tuberculiformibus raris obsitis; foliolis 6–8-jugis glaucescenti-æruginosis obovatis retusis obcordatisve manifeste petiolulatis subtus (rachique in foliis summis submarginata) grosse glandulosis; spicis paniculatis brevibus paucifloris; bracteis coriaceis ovatis muticis glandulosis calycem vix æquantibus caducis; tubo calycis sessili glabro glandulis magnis cerinis ornato, dentibus brevibus triangulato-subulatis margine villosis; corolla violacea, carina maxima vexillo plus duplo longiore. — Rocky hills, and high plains, along the margin of thickets, on the Guadaloupe, Sabinas, and Pierdenales. July, August. (Western Texas, and on the Rio Grande, *Mr. Charles Wright.* Monterey, N. Mexico, *Dr. Edwards in Herb. Torr.*) This is a shrubby species, a foot or two in height, and totally distinct from *D. citriodora*, for which I at first mistook it. The flowers are more like those of *D. nutans*, but they are much fewer, sessile, the calyx remarkably glandular; the leaflets are of a different form, not at all crenate; and there is a gland,

instead of a subulate stipel, on the rachis at the insertion of each leaflet.[1]

(596.) Astragalus caryocarpus, *Ker, Bot. Reg.* t. 176; *Torr. & Gray, Fl.* 1. p. 331. Clayey soil, near Victoria. February, in flower. Also (598) in Western Texas, in flower and fruit.

(597.) A. Mexicanus, *Alph. DC. Pl. Rar. Hort. Genev. not.* 5. p. 17. t. 3. A. trichocalyx, *Nutt. in Torr. & Gray, Fl. l. c.* Prairies on the Lower Guadaloupe, west of Victoria. February, in flower. — This and the last species, although often confounded in herbaria, are manifestly distinct in the living state. *A. caryocarpus* has more strigose and somewhat canescent, oblong or linear-oblong leaflets, close and fine hairs on the calyx, sometimes blackish, a violet purple corolla, the flower about two thirds of an inch long, and ovate pointed legumes, which are seldom more than two thirds of an inch in diameter. *A. Mexicanus* is a larger plant in all its parts, with smoother and greener foliage; the leaflets varying from roundish-obovate to oblong; the flowers an inch long; the calyx villous, (often very densely) with soft, white hairs; the corolla barely tinged above with pale violet, or nearly white; and the very turgid globose-ovoid legumes are obtuse and over an inch in diameter.[2]

[1] Petalostemon virgatum, *Scheele in Linnæa*, 21, p. 461, is plainly the No. 42, *Pl. Lindh.* and No. 137, *Pl. Fendl.*, viz. a pubescent variety of *P. violaceum*, perhaps connecting that species with *P. decumbens*. The leaves in some specimens are indeed 7-foliolate, in others both 5-foliolate and 3-foliolate. — Trifolium Rœmerianum, *Scheele, l. c.* is manifestly the T. amphianthum, *Torr. & Gray, Fl.* 1. p. 316.

[2] This Texan plant is clearly De Candolle's *A. Mexicanus;* but Dr. Engelmann thinks it distinct from the *A. trichocalyx*, of Missouri; on account of the still larger and pale purple flowers, and shorter calyx-teeth. The remarks above are chiefly founded on living plants of A. trichocalyx and A. caryocarpus, raised from seeds furnished by Dr. Engelmann from St. Louis.

Mr. Wright has communicated specimens of a new Texan species of Astragalus, and also seeds from which the plant has been raised, during the past summer in the Cambridge Botanic Garden.

Astragalus Wrightii (*sp. nov.*): annuus, pumilus, hirsuto-canescens; caule subsimplici; *stipulis subulatis liberis; foliolis 3-5-jugis oblongis acutiusculis;* pedunculis folio longioribus paucifloris; floribus capitatis; calyce hirsutissimo, lobis lineari-subulatis attenuatis corollam violaceam superantibus legumine oblongo hirsuto subtereti fere biloculari 6-4-spermo dimidio brevioribus. — Texas, near Austin, *Mr.*

(599.) Zornia tetraphylla, *Michx. Fl.* 2. p. 76. Post-Oak openings west of the Pierdenales. June.

(600.) Lupinus Texensis, *Hook. Bot. Mag.* t. 3492. New Braunfels. Not distinct, I fear, from *L. subcarnosus.*

377. Cercis occidentalis (*Torr. ined.*): frutex; foliis subreniformibus obtusissimis; leguminibus oblongis obtusissimis breviter apiculatis vix stipitatis. — C. Siliquastrum, var. *Benth. Pl. Hartw.* No. 1706, p. 307. — Var. floribus etiam paulo minoribus, foliis supra nitidioribus. C. reniformis, *Engelm. Mss.* Rocky plains of the Upper Guadaloupe. March, in flower; June, with ripe fruit. A shrub, forming thickets, never becoming a tree. — This is entirely distinct from *C. Canadensis;* but does not differ from the Californian plant of Fremont and of Hartweg, except that the flowers are a little smaller still, being no larger than those of *C. Canadensis,* and the full-grown leaves are rather thicker and more shining above. The Texan and the Californian plants agree in their short and scarcely stipitate pods (only 2 or 2½ inches long, and two thirds of an inch broad,) which character, with the size of the flowers, would seem abundantly to distinguish it from *C. Siliquastrum,* the legumes of which, including the manifest stipe, are six, or at least five inches in length. (Dr.

Charles Wright. — The plants from seeds sown in the spring blossom from midsummer to autumn. Stem a span high, seldom branched. Leaflets 4 lines long, the upper surface sparsely, the lower densely beset, like the stem, &c., with villous-hirsute loosely appressed hairs. Peduncles in fruit 2 or 3 inches long. Legumes half an inch long, densely hirsute, straight, rather acute, tipped with the short style, often carrying away the inconspicuous corolla upon its apex as it enlarges, nearly erect, only three or four produced in each capitulum, scarcely twice the length of the persistent subsessile calyx. Bracts subulate, the lower resembling the calyx-lobes. — Mr. Wright has also detected Oxytropis Lamberti, *Pursh*, in Western Texas; and likewise a unifoliolate Desmodium, namely: —

Desmodium Wrightii (*sp. nov.*): caulibus gracilibus ramosis puberulis; foliis unifoliolatis breviter petiolatis; foliolo membranaceo oblongi-ovato obtuso basi subcordato fere glabro; stipulis stipellisque subulatis minimis; racemis laxis; tomento 3–4-articulato breviter stipitato, articulis inæquilateris ovalibus. — Austin, Texas, *Mr. Charles Wright.* — Stems one or two feet high. Leaves veiny, paler and minutely pubescent underneath, mucronulate; the lower two inches long, on petioles half an inch long; the upper successively narrower and smaller, on shorter petioles. Legume less than an inch long; the stipe as long as the stamineal tube.

Gregg has gathered fruiting specimens of the same plant in the high lands near Saltillo, Mexico, in 1848.) — Dr. Engelmann states that it is peculiar to the limestone districts of Middle Texas.

378. SOPHORA (STYPHNOLOBIUM) AFFINIS, *Torr. & Gray, Fl.* 1. p. 390. Margin of Cotton-wood groves along the Rio Colorado, above Bastrop: August (in fruit); also near New Braunfels and San Antonio, common; April, in flower. — "A small tree, 10 to 12 feet high, the trunk 4 to 8 inches in diameter, rarely a small shrub; the annual shoots with green bark, fragile; the wood very heavy." Leaflets less than an inch long, nearly of the same hue both sides, retuse or very obtuse. No. 601 is the same plant, from New Braunfels.

379. SOPHORA (DERMATOPHYLLUM) SPECIOSA, *Benth. Mss.* Dermatophyllum speciosum, *Scheele in Linnæa,* 21. p. 459. Sophora sempervirens, *Engelm. Mss.* "On the western part of Matagorda Bay, where it forms groves. Also sparsely on rocky hills, margins of Cedar woods along the Guadaloupe, near New Braunfels, &c. Flowers in February. A small tree, about 30 feet high; the wood yellow, hard, and heavy, called *lignum-vitæ.* Flowers, showy, blue, sweet-scented, exhaling nearly the fragrance of violets. The tree forms small groves on the shores of Matagorda Bay, where it is the only fire-wood. The wood dyes yellow." Also gathered by Berlandier, and by Mr. Wright. The large, woody pods, two to four inches long, are sometimes constricted between the seeds, sometimes barely torose. Mr. Bentham remarks, in *Herb. Torr.*, that, "at present Dermatophyllum can only be admitted as a section to include *S. speciosa, S. secundiflora,* and an intermediate species collected by Dr. Gregg in Northern Mexico, until the pods of all the genus are better known." — No. (602) is the same species from New Braunfels, flowering in March, either a shrub or a small tree.

(603.) HOFFMANSEGGIA JAMESII, *Torr. & Gray, Fl.* 1. p. 393; *Gray, Pl. Fendl.* p. 38. Stony soil on the Liano. October; the second flowering, after the burning of the

prairies. Shrubby, many stems form a large ligneous root, one or two feet high. Upper surface of the leaves smooth, and with the petals, destitute of the black glands. "Petals yellow; stamens red."[1]

380. Cassia (Chamæsenna) Lindheimeriana (*Scheele in Linnæa*, 21. p. 457): perennis, undique tomento sericeo mollissimo albicans; foliolis 6–8-jugis oblongis utrinque obtusis basi inæqualibus aristato-mucronatis subtus argenteo-sericeis; glandula cum stipite tomentoso setiformi inter omnia paria; stipulis subulatis caducis; racemis folium æquantibus plurifloris; legumine lato-lineari complanato parce pilosulo. — Rocky plains and margin of woods, New Braunfels, &c. September. Also found by Mr. Wright from San Marcos to the Rio Grande. — Stems 4 or 5 feet high, from a thick, perennial root, clothed like the petioles, peduncles, stipules, &c. with a dense velvety tomentum. Leaflets from one to nearly two inches in length, silky above, silvery-sericeous beneath, tipped with a very conspicuous mucro. The setiform gland, with its stipe, between each pair, is a line long. Petals golden yellow with dark veins, half an inch in length. Anthers 7, chocolate-colored; the three upper stamens rudimentary. Legumes 2 inches long, over 2 lines wide. Seeds as in the section. — A species apparently allied to C. argentea and C. mollissima, *H. B. K.*

[1] The subjoined, very distinct species, comes from the southern borders of Texas.

Hoffmanseggia caudata (*sp. nov.*): frutescens; ramis glaberrimis superne rachique foliorum glandulis minimis rariter conspersis; foliis bipinnatis; pinnis 2–3-jugis abrupte 8–10-*foliolatis*, *cum impari* elongata 24–30-juga; foliolis glaberrimis omnino glandulosis rotundatis oblique subcordatis venosis; stipulis bracteisque caducis; racemo sparsifloro; legumine acinaciformi dilatato glanduloso. — Sandy soil, between the Nueces and the Rio Grande, Texas, *Mr. Charles Wright.* August, September. — This species is remarkable for its smoothness (some small tack-shaped glands only occurring on the calyx, or a few still minuter ones scattered on the upper part of the branches and the petioles,) and for the elongation of the terminal pinna, which is two or three inches in length, and bears many pairs of leaflets; while the lateral ones are scarcely an inch long. The leaflets are about two lines in length, thickish, obscurely mucronulate, subsessile, oblique. Raceme sparsely 6–9-flowered. Legume nearly two inches long and two thirds of an inch wide, flat, reticulated, furfuraceous-glandular, and roughened with subsessile blackish glands. There are no expanded flowers; the raceme of one specimen bears unopened flower-buds.

381. C. (Chamæsenna) Rœmeriana, (*Scheele, l. c.*): caule suffruticoso cinereo-pubescente; foliolis unijugis e basi inæquilatera rotundata lanceolatis acutiusculis mucronatis supra puberulis subtus strigoso-pubescentibus; glandula subulata interposita; stipulis setaceis caducis; racemis paucifloris folium superantibus; legumine lineari-oblongo basi attenuato subfalcato glabello. — Rocky plains of the Upper Guadaloupe. August. Also communicated by *Mr. Wright.* — Plant one or two feet high, much branched. Leaflets about two inches long, gradually tapering from the rounded inæquilateral base, sometimes a little falcate, beneath somewhat cinereous with fine strigose hairs. Petals yellow, with brownish veins, one third of an inch in length. Legumes an inch or little more long, with a prominent border, minutely and sparsely strigose.[1]

† C. pumilio (*sp. nov.*): subcaulescens e caudice lignescente, strigulosa; foliolis unijugis linearibus subtrinervatis; glandula nulla; petiolo in appendicem setaceam producto; stipulis setaceo-subulatis petiolo basi adnatis rigidis persistentibus; pedunculis unifloris folio longioribus infra apicem unibracteatis; sepalis obtusissimis; staminibus 3 superioribus difformibus castratis; ovario glaberrimo; fructu ignoto. — On the Liano and Pierdenales. "Only two small specimens were seen." Rio Grande, Texas, *Mr. Charles Wright.* The caudex of this singular dwarf species scarcely rises out of the

[1] From the Rio Grande, Texas, as well as from Northern Mexico, we have the subjoined species, which is said by Mr. Bentham (in *Herb. Torr.*) to be "a very distinct, new species, apparently near C. bauhiniæfolia." It belongs, however, to the section Chamæsenna.

Cassia (Chamæsenna) bauhinioides (*sp. nov.*): humilis, suffruticosa, hirsutosericea; foliolis unijugis rariusve bijugis oblongis vel subovatis utrinque rotundatis inæquilateris sericeo-canescentibus; glandula interposita; stipulis setaceis persistentibus; pedunculis 2-3-floris; legumine membranaceo turgido rectiusculo hirsuto. — On the Rio Grande, Texas, August (in fruit,) *Mr. Charles Wright.* Santa Rosalia, Northern Mexico, May (in flower only,) *Dr. Gregg.* Between El Paso and Chihuahua, August, *Dr. Wislizenus.* — The plant of Dr. Wislizenus is 10 inches high, larger in all its parts and less canescent than the other specimens, which are from three to six inches high. The peduncles in the latter are shorter than the leaves. The three upper stamens are rudimentary; the linear-oblong anthers open only by a terminal pore. Legumes an inch long, slightly curved upwards, very obtuse, and with an incurved apiculate tip.

ground. Leaves crowded. Leaflets an inch or less in length, one to two lines wide, rather rigid, as long as the petiole. Peduncle one or two inches long, slender. Corolla two thirds of an inch in diameter, pale yellow in the specimens. The seven perfect anthers open by a terminal pore; the three upper stamens are abortive, as in the section Chamæsenna, to which, so far as can be told in the absence of the fruit, this species would seem to belong.

382. ALGAROBIA GLANDULOSA, *Torr. & Gray, Fl.* 1. p. 399. Common on the Guadaloupe, &c. May, in flower; August, with unripe fruit.—The *Muskit* "forms open woods in high, rocky plains, and wet, clayey bottoms. Trees from 30 to 40 feet high, with few and large, erect branches; the trunk often from one to two and a half feet in diameter; the heart-wood dark reddish brown; but often occurring as a small tree or shrub. Important as furnishing the only fire-wood in Western Texas; also for its edible fruit." *Lindheimer.*—The foliage appears different from that of A. dulcis, *Benth.*, in Hartweg's Mexican Collection.

383. MIMOSA LINDHEIMERI (*sp. nov.*): fruticosa, glabra, v. sub lente minutim puberula; aculeis infrastipularibus validis geminis (nunc solitariis ternisve) recurvis, petiolaribus minutis raris v. nullis; stipulis subulatis etiam spinescentibus; pinnis 4–6-jugis; foliolis 8–12-jugis oblongis; pedunculis folium subæquantibus; capitulis globosis; bracteolis minutis; floribus 5-meris glaberrimis; legumine glabro lineari-oblongo seu falcato margine aculeis validis sparsis subuncinatis armato.—Rocky plateaus near New Braunfels, and on the Upper Guadaloupe, not seen on the Pierdenales. July, in flower, and with young fruit: August, with ripe fruit.—Shrub two or three feet high; the branches armed with very stout, compressed, infrastipular aculei, which are sometimes solitary, germinate, often usually in threes. Occasionally there are one or two minute prickles on the rachis of the leaves. Calyx purple, very glabrous. This species is nearly allied to M. acanthocarpa, of Mexico, from which it differs in the want

of pubescence, except a mere trace under the lens, and in the spinescent stipules. The valves of the pod somewhat inclin e tobreak transversely into pieces.

(606.) M. FRAGRANS (*sp. nov.*): fruticosa, erecta, glaberrima; aculeis infrastipularibus solitariis subrecurvis; petiolis inermibus gracilibus; pinnis 1–3-jugis (in ramis floridis sæpissime unijugis); foliolis 5–6-jugis lineari-oblongis; pedunculis axillaribus sæpius fasciculatis folio æqualibus capitulum globosum gerentibus; floribus 5-meris 10-andris glabris; petalis liberis calyce parvo quadruplo longioribus; legumine lineari falcato 6–8-articulato membranaceo glaberrimo inermi, rariusve margine aculeis 1–3 armato.—Rocky soil, on the Pierdenales. April, in flower (606); May, with immature fruit (607). (Also gathered near Austin by *Mr. Wright*).—"Shrub 3 or 4 feet high, covered at the season of blossoming with the heads of light purplish-red, fragrant flowers." Aculei short and stout. Leaflets rather thin, not crowded as in the preceding species, rather sparse on the sterile branches, where they are two lines long; on the flowering branches smaller. Peduncles nearly an inch in length, larger than the head. The unripe pods are two inches long; strongly falcate, the margins sinuate so that the joints are well defined, and the transverse lines at which the valves will separate are already evident.—This species is allied to M. borealis, *Gray, Pl. Fendl.* (which much resembles M. depauperata, *Benth.*) of which I think I have a Texan specimen from Mr. Wright; but the pinnæ are much longer, with more numerous and narrower leaflets, and the pods are different. It is perhaps the same as a North Mexican species of Dr. Gregg, indicated by Mr. Bentham (in *Herb. Torr.*) as "Mimosa, *n. sp.* near M. terniflora," a species which I do not find anywhere enumerated.[1]

[1] On the Rio Grande, Texas, Mr. Wright gathered specimens of the subjoined species of the section *Habbasia*, § *Rubicaules*, Benth.

MIMOSA MALACOPHYLLA (*sp. nov.*): suffrutescens, pube mollissima undique sericeo-tomentosa; caulibus procumbentibus angulatis petiolisque copiosissime aculeatis, aculeis brevibus uncinato-retrorsis; pinnis 4–7-jugis; foliolis 5–8-jugis ovatis

384. Schrankia platycarpa (*sp. nov.*): glabra, leviter aculeata; pinnis 4–6-jugis; foliolis oblongis ciliatis aveniis: leguminibus latiuscule linearibus compressis acuminatis aculeis brevibus echinatis pedunculo subduplo longioribus, valvulis planis margine persistente (replo) fere duplo latioribus. — Mimosa Rœmeriana, *Scheele in Linnæa*, 21. p. 456? — Dry, stony, prairies, New Braunfels. April, in flower; September, in fruit. — I have seen this species from other Texan correspondents. It is distinguished from *S. angustata*, in some degree by its rather broader and more ciliate leaflets, and obviously by its legumes, which are about three inches long, but a quarter of an inch in width, flat, and about twice the breadth of the persistent margin; thus confirming Mr. Bentham's remark, that the genus is not sufficiently distinct from Mimosa. The valves are rather sparsely, the thickened margin densely, echinate with very short, somewhat uncinate prickles. From the locality this is most probably the Mimosa Rœmeriana of Scheele; but that blundering and unscrupulous propounder of species had not seen the legumes, and his description applies nearly as well to any other Schrankia. To the latter genus, so long as it is maintained, the present species must be referred, notwithstanding the flatness of the pod.

385. Desmanthus velutinus (*Scheele in Linnæa, l. c.*): adscendens v. prostratus e basi suffrutescente; caulibus petiolisque pube mollissima cinereis; pinnis 3–6-jugis, glandula parva concava inter infimas; foliolis 10–20-jugis lineari-oblongis aveniis margine præsertim pilosis; floribus decan-

vel ovali-oblongis mucronatis; panicula racemosa laxa; floribus 5-meris 10-andris; legumine lato-lineari longiuscule stipitato membranaceo glabro nitido inermi 6–8-spermo. — On the Rio Grande, Texas, *Mr. Charles Wright.* August, September, in flower and fruit. Also gathered near Monterey, Northern Mexico, by *Dr. Gregg* and *Dr. Edwards*, without fruit; and east of Rinconada by *Dr. Gregg* in 1848. — Plant with the habit of a Schrankia, canescent with a fine and very soft down; the partial and general petioles as well as the stem beset with numerous short uncinate prickles. Leaflets 3 to 5 lines long. Flowers white, according to Mr. Wright, yellowish according to Dr. Gregg. Legume two inches or more in length, with a stipe half an inch long, very smooth.

dris; leguminibus linearibus elongatis rectis v. rectiusculis acuminatis lævibus 10–20-spermis; seminibus rhombeo-orbiculatis. — Rocky soil, and on grassy slopes, near New Braunfels. August, chiefly in fruit. Also near Austin, *Mr. Charles Wright*. — A well marked species, which Scheele has described from some of the rather imperfect fruiting specimens gathered by Lindheimer in 1846, in which the legumes are sometimes only an inch and a half long, and a little falcate. But in better specimens, particularly in those of 1847, the pods are straight, from two to three inches long, often 20-seeded. The seeds are not obovate-elliptical, but roundish-obovate, or somewhat rhombic by mutual pressure. It is distinguished from all the species I am acquainted with by its downy stems and minute gland; from *D. depressus* by its pointed pods. — D. depressus, *Kunth*, is common at Key West and Cape Florida, and occasionally comes from Texas. There, however, a more common species is the allied D. acuminatus, *Benth. in Jour. Bot.* 4, p. 357, which is readily known by its shorter, falcate, and pointed pods. In cultivation it is prostrate. D. reticulatus, *Benth.*, has also been received from Mr. Wright.

386. D. BRACHYLOBUS, *Benth. Mimoseæ, in Jour. Bot.* 4. p. 358. D. falcatus, *Scheele in Linnæa*, 21, p. 455. Wet soil near Comale Creek, &c. May, in flower; August, in fruit. This does not grow in dry, rocky soil, nor the foregoing in wet places, as is stated by Scheele, who has evidently transposed the tickets of these two plants.

387. ACACIA RŒMERIANA, *Scheele in Linnæa*, 21. p. 456. Rocky soil, near San Antonio, and from New Braunfels to the Guadaloupe. April, in flower; June, in fruit (605). — This would appear to be the Acacia Rœmeriana of Scheele, said to have been gathered near Austin by Mr. Römer, except that the flowers are "yellowish-white" (*Lindh.*) instead of rose-color, and the leaves usually bear three pairs of pinnæ. The leaflets, 4 to 5 lines long, are membranaceous in the flowering specimens, but firmer in those in fruit. The species be-

longs to Bentham's section *Vulgares,* and subsection *Pennatæ.* The legume is coriaceo-chartaceous, continuous within, flat, linear-oblong or oblong, somewhat falcate, 2½ to 4 inches long, an inch or less in width, raised on a short stipe. Seeds oval, flat, brown. It is said to be a shrub, or small tree, with the stem one or two inches thick. There are specimens of it in Dr. Gregg's North Mexican collection. Another Acacia of the latter collection, marked by Mr. Bentham *A.* (*Ataxacantheæ*) *n. sp.*, not unlike the above in foliage and fruit, but with a different inflorescence, was found by Mr. Wright from San Antonio to the Rio Grande.[1]

(604.) Same as the foregoing, with larger leaflets; in flower only.

(605.) These are fine fruiting specimens, which I refer to *A. Rœmeriana*, and to them alone the remarks above, as respects the legumes, refer.

ROSACEÆ.

388. Prunus minutiflora (*Engelm. ined.*): nana, intricato-ramosissima, glabra, ramulis novellis vix puberulis; foliis parvis ovalibus obovatisve obtusissimis integerrimis aut obsolete parceque denticulatis; floribus solitariis subsessilibus minimis 10–15-andris; calyce turbinato; fructu immaturo subgloboso cano-tomentoso. — Hills and dry slopes between San Antonio and New Braunfels, in large clusters. March, in flower; the unripe fruit (4 lines in diameter) gathered at the end of May. — Shrubs one or two feet high, forming dense masses. Leaves from 3 to 5 lines long, on short, glandless petioles, fascicled, coriaceous, smooth, entire, sometimes tridenticulate or with one or two obscure lateral denticulations, which are at first somewhat glandular. Stipules very minute. Flowers solitary, a line and a half in length; the peduncle shorter than the calyx. "Stamens 10 to 15, in two

[1] Among Dr. Gregg's plants I find well-marked specimens of A. amentacea, *DC.*, a species not identified by Mr. Bentham. It was gathered, in flower, near Rinconada.

or three circles, the innermost partially abortive." *Engelm.* — Closely allied to the Amygdalus microphylla, *H. B. K.*, and very likely to prove a variety of it, judging from the fragment of that plant which I possess from Schlechtendal. These, with *P. glandulosa*, belong to the subgenus MICROCERASUS, *Webb*, characterized by *Spach in Ann. Sci. Nat.* 2. *Ser.* 19. p. 125; a group "intermediate between the true Cerasi and Prunus [but referred by these authors to the former] and also nearly allied to some Amygdali." It embraces *Cerasus prostrata*, *C. orientalis*, and some other oriental species.

389. P. RIVULARIS, *Scheele in Linnæa* 21. p. 594. P. Tawakonia, *Lindheimer, Mss.* (which name was doubtless appended to the specimen received by Scheele.) Banks of streams and margins of bottom-woods, forming thickets near the water, rarely on higher places, Upper Guadaloupe, and between Comale Creek and the Colorado. March, in flower; June, in fruit. "Shrub from two to six feet high. Fruit ripe in June, of the size of a cherry, or a little larger, acidulated, cherry-red. The Tawakony Indians boil them and eat them with honey. Called *Tawakony Plum.*" *Lindheimer.* — The same plant extends northward into Missouri, and passes, if I mistake not, into an evident form of Prunus Americana, or *P. nigra*, if the two species are to be distinguished. P. Texana, *Scheele, l. c.* gathered at New Braunfels, by Mr. Römer, is probably the same species.

† CERASUS SEROTINA, *DC.*; *Torr. & Gray, Fl.* 1. p. 410. On the Pierdenales. April, in flower. A tree or a large shrub.

(608.) ROSA FOLIOLOSA, *Nutt. in Torr. & Gray, Fl.* 1. p. 460. Hills of the Sabinas and Three Creeks. May. — Stems less than a foot high, from a creeping rootstock. "Flower very fragrant."

† CRATÆGUS COCCINEA var.? MOLLIS, *Torr. & Gray, Fl.* 1. p. 465. C. mollis, *Scheele in Linnæa*, 21. p. 569. Muskit flats near San Antonio. March, in flower. — If this be admitted to rank as a species, it must bear, I believe, the name of C. subvillosa, *Schrad.*

ELATINACEÆ.

390. ELATINE (MERIMEA seu BERGIA) TEXANA, *Hook. Ic. Pl.* t. 278; *Torr. & Gray, Fl.* 1. p. 678. E. (Bergella) Texana, *Gray, Gen. Ill.* 1. p. 218. t. 96. In slow flowing rivulets, New Braunfels. August. — This is a pentamerous and decandrous or sometimes pentandrous Elatine, with the aspect of Bergia, for which, in the work above cited, I have indicated a distinct section.

LYTHRACEÆ

† LYTHRUM ALATUM var. OVALIFOLIUM: humile; foliis suborbiculatis et ovalibus, floralibus oblongis calyce brevioribus. L. ovalifolium, *Englm. Mss.* Springs of the Pierdenales, on rocks covered by water. October. — Stems a foot high, from long and creeping stolons. Leaves one third of an inch long. This evidently runs into the next.

(609.) L. ALATUM, var. PUMILUM: foliis ellipticis oblongisve, caulibus spithamæis. Rocks partly covered with water, in Sister Creek. April. — Mixed with this in the distribution are a few fruiting specimens of

† L. ALATUM, var. BREVIFLORUM: glabrum, ramosissimum; ramulis angulatis; foliis linearibus plerisque alternis, floralibus, flores approximatos 6-petalos 6-andros subæquantibus; calyce fructifero campanulato seu brevissime clavato subpedicellato; stylo incluso vel breviter exserto. — Damp rocks on the Guadaloupe, near running water. The specimen is the branching summit of an apparently rather tall stem, which has lost its lower leaves. The floral leaves are only from one to three lines long; the flowers are so approximated as at length to form a virgate spike. The calyx even in fruit is barely a line and a half in length. Petals purple, small, those of the later flowers minute or wanting. The style is shorter than the petals, often included, or barely equalling the stamens; but the specimen, perhaps, belongs to a stamineal form. Vide *Pl. Lindh.* p. 8. No. 52.

(610.) L. ALATUM, var. (LANCEOLATUM), *Torr. & Gray, Fl.* 1. p. 481. L. lanceolatum, *Ell. Sk.* 1. p. 544. Wet prairies, on the Pierdenales. May. — A form with dwarf stems, a foot or less in height, from long, and deeply subterranean root-stocks or stolons.

† L. ALATUM, var. γ. *Torr. & Gr. l. c.* — On the Cibolo. — Leaves mostly alternate.

† L. ALATUM, var. LINEARIFOLIUM: caulibus ramosissimis; foliis linearibus plerisque alternis, floralibus calyce subæqualibus. — Rocks in the Cibolo River. This and the var. *ovalifolium* are two extreme forms, on either hand, of what I take to be one polymorphous species; for which the name L. lanceolatum, *Ell.*, would be much more appropriate than that of Pursh. They may embrace several of the tropical American species in the books; but they pass into one another in such a way that Dr. Engelmann and I can fix upon no reliable distinguishing characters.

† AMMANNIA LATIFOLIA, *Linn.; Torr. & Gr. Fl.* 1. p. 480. (the A. stylosa, *Fisch. & Meyer, Ind. Sem. Hort. Petrop.* 7, p. 41): var. octandra, staminibus exsertis, stylo brevi incluso! A. Texana, *Scheele in Linnæa*, 21, p. 588. Upper Guadaloupe.

ONAGRACEÆ.

391. ŒNOTHERA (MEGAPTERIUM) MISSOURIENSIS, *Sims, Bot. Mag.* t. 1592; *Torr. & Gr. Fl.* 1, p. 500: var. A. foliis anguste lanceolatis linearibusve. Megapterium Missouriense, *Spach.* Rocky plains and slopes, on the Pierdenales and Upper Guadaloupe, and in the dry bed of the Cibolo. April to July; in flower and fruit. Also gathered by Mr. Wright, who sends seeds from which the plant has been raised in the Cambridge Botanic Garden. "Capsule larger or smaller, orbicular, or elliptical-oblong; corolla from two to five inches in diameter. This runs, by every gradation in the broadness of the leaves into the var. β. LATIFOLIA foliis lato-lanceolatis vel ovato-lanceolatis, (Œ. macrocarpa, *Pursh.; Sweet, Brit. Fl. Gard.* t. 5. Megapt. Nuttallii, *Spach.*) Nor, with both

plants in cultivation, do I discern any distinction in the flowers or pods. On the Upper Platte and Canadian, Fremont and Mr. Gordon have gathered specimens in which even the full-grown leaves &c. are silvery-canescent; namely, var. γ. INCANA: foliis lanceolatis vel ovatis undique argenteo-incanis.

392. Œ. (LAVAUXIA) TRILOBA, *Nutt. in Jour. Acad. Philad.* 2. p. 118; *Hook. Bot. Mag.* t. 2566; *Torr. & Gray, l. c.* Œ. Rœmeriana, *Scheele in Linnæa*, 22. p. 154. Muskit flats, New Braunfels. March, April. In cultivation, and I think also in the wild state, this is a biennial. It forms a dense cone of pods at the crown, which rises to the height of two or three inches in the course of the season, and the root does not survive the winter. The flowers, which open about sunset, are cream-colored or nearly white.

393. Œ. (MERIOLIX) SERRULATA δ. SPINULOSA, *Torr. & Gray, Fl.* 1. p. 502; subvar. floribus, ut in No. 238, maximis, calycis fauce cum stigmate sæpius atropurpurea interdum fusca v. flava. — Rocky banks of the Cibolo River. April. In cultivation, as in the wild plant, the throat of the calyx and the disk-shaped stigma, one or both, are sometimes deep black-purple, sometimes brownish or yellow. The plant forms rather stout and decumbent woody stems, two or three feet long, producing a great number of branches, and flowering throughout the summer.

394. Œ. SERRULATA, ε. PINIFOLIA, *Engelm.*: foliis angustissimis fere filiformibus sæpe fasciculatis marginibus revolutis integris; floribus maximis (ut in præcedente). Œ. capillifolia, *Scheele in Linnæa*, 21. p. 577. Rocky prairies, New Braunfels. April. — This is just the Œ. serrulata var. spinulosa, except that the leaves are extremely narrow. It is vain to attempt to erect the varying forms of this and other polymorphous Œnotheræ into separate species.

(55.) Œ. SPECIOSA, *Nutt.* New Braunfels, March.

(53.) Œ. DRUMMONDII, *Hook.* Galveston. March to May.

† Œ. JAMESII (*Torr. & Gray, Fl.* 1. p. 693): pube ap-

pressa cinereo-canescens; caule erecto elato (5–10-pedali) lignescente; foliis oblongo-lanceolatis acutis repando-denticulatis; spica multiflora conferta; tubo calycis prælongo (4–5-unciali) canescente crassiusculo apice ampliato segmentis 2–3-plo ovario multoties longioribus; petalis flabelliformibus maximis (2–3-pollicaribus) stylum vix æquantibus; stigmatibus prælongis; capsula cylindracea subcinerea. — Banks of rivulets on the Upper Guadaloupe; also on the San Fernando and the Liano. August. — Cultivated from Texan seeds, this most showy and almost gigantic species flowers in October, either as an annual or a biennial, bearing profusion of flowers, of which an unusual number are open at the same time. Although altogether like that of an ordinary annual or biennial, the tall stem becomes perfectly woody below, and often two inches in diameter at the base. The expanded corolla is four or five inches in diameter, as large as in *Œ. Missouriensis*; the anthers three fourths of an inch, and the stigmas half an inch, in length.[1]

395. Ludwigia natans, *Ell. Sk.* 1. p. 581; *Torr. & Gray, Fl.* 1. p. 526. L. fluitans, *Scheele in Linnæa*, 21. p. 580. Comale Spring, in clear rivulets. May, in flower and fruit. — This is Elliott's plant in all respects.

† L. palustris, *Ell. l. c.* On the Liano. November.

(240.) Gaura Drummondii, *Torr. & Gray, Fl.* 1. p. 517. New Braunfels, April.

(241.) G. parviflora, *Dougl. in Hook. Fl. Bor.-Am.* San Antonio.

(60.) G. sinuata, *Nutt.*; *Torr. & Gray, l. c.* New Braunfels.

(611.) Gaura suffulta (*Engelm. Mss.*): annua; caule 1–2-pedali pilis longis patentibus barbati-villoso; ramulis floriferis cum floribus bracteisque glaberrimis; foliis pilosiusculis glabratis lanceolatis utrinque attenuatis repando-sub-

[1] Œ. uncinata, *Scheele in Linnæa*, 21. p. 578. is not to be identified by the vague description. It was gathered on a prairie near Houston by Mr. Römer, and is not likely to be new.

dentatis, inferioribus oblongo-lanceolatis petiolatis; floribus 4-meris 8-andris; bracteis oblongis ovario longioribus e basi brevi persistente caducis; rachi ideoque squarroso-dentata; tubo calycis ovario longioribus segmentis brevioribus; nuce sessili alato-tetraquetra ovato-pyramidata glabra, faciebus concavis unicostatis lævigatis aut basi parce subtuberculatis. — Cedar woods, in sandy and rocky soil, New Braunfels. May, June, in flower and fruit. — Plant, with much the aspect of G. Drummondii; but the leaves smoother, less toothed, and "longer petioled than any other;" the stem villous or hirsute below with long spreading hairs, while the rachis, calyx, bracts, &c. are perfectly glabrous. The petals appear to be paler than those of G. Drummondii, and the fruits are closely sessile, without any narrowed base or stipe. It is much more closely related to the Gaura tripetala, *Cav.*; judging from Spach's description, and from Texan specimens with triquetrous fruit and trimerous flowers, gathered by Mr. Wright, which agree well with the character.[1]

† Myriophyllum heterophyllum, *Michx.* With the next.

† Proserpinaca pectinacea, *Lam.* On the Pierdenales.

LOASACEÆ.

396. Mentzelia oligosperma, *Nutt.; Torr. & Gray, Fl.* 1. p. 533. Thickets, on high, rocky plains of the Upper Guadaloupe. August.

† Mentzelia (Bartonia) nuda, *Torr. & Gray, Fl.* 1. p. 535; *Gray, Pl. Fendl.* p. 47. Springs of the Cibolo, Guadaloupe, and Pierdenales, in rocky soil. July, October. "Stems three to five feet high: petals expanded in the evening, not in the morning."

† Eucnide bartonioides, *Zucc. Pl. Hort. Bot. Monac. fasc.* 5, *in Abhandl. Baier. Akad. Wissensch.* 4. t. 1. Mi-

[1] Gaura hirsuta, *Scheele, in Linnæa*, 21. p. 580, described from specimens gathered by Römer between Bastrop and Austin, does not accord with the present species, but is likely to be either G. Lindheimeri or G. biennis. G. Rœmeriana of the same author, from New Braunfels, described without the fruit, may be safely referred to G. Drummondii.

crosperma bartonioides, *Walp. Repert.* 5. p. 776, & *Ann. Bot. Syst.* 1. p. 794; *Hook. Bot. Mag.* t. 4491. On perpendicular rocks, near New Braunfels. April, in flower. (Also on rocky cliffs near Ojito, April, *Dr. Gregg.*) "Plant succulent, full of aqueous juice." — Hooker's prior name of *Microsperma* must give way to *Eucnide*, Zucc., as there is a much older genus *Microspermum* of Lagasca, also Mexican. Eucnide lobata (Microsperma lobata, *Hook. Ic. Pl.* t. 234, probably also M. rudis, *Schauer in Linnæa*, 20. p. 721, as the stamens are not always as short as in Hooker's figure), was likewise gathered near Monterey, Saltillo, &c. by Dr. Gregg, and at Zimapan, by Coulter.

PASSIFLORACEÆ.

Passiflora tenuiloba (*Engelm. Mss.*): "petiolis brevibus eglandulosis; foliis supra pilis brevibus subscabris subtus glabriusculis trinerviis reticulatis basi biglandulosis subcordatis trilobis, lobis lateralibus lanceolato-linearibus elongatis cuspidatis horizontaliter divergentibus vel recurvatis, medio brevissimo in fol. inferioribus integro in superioribus breviter trilobo; stipulis setaceis; pedunculis binis petiolum bis superantibus; cirrho elongato simplici; floribus exinvolucratis apetalis; calyce 5-lobo virescente. — On the Liano; coll. in October. — Apparently near P. normalis, *L.*, of Jamaica, which is unknown to me. Herbaceous, sub-erect, slender. Petioles 2, the peduncles $3-3\frac{1}{2}$, lines long. Leaves rather rigid, with revolute margins, 5 or 6 lines long, but from 3 to 5 inches in transverse diameter; the lobes about 3 lines wide, the lateral ones sometimes bearing a posterior tooth or lobule. Flowers 8 or 9 lines in diameter. Only a single specimen was gathered by Lindheimer." *Engelm. in litt.* — I have this plant from Mr. Wright, gathered two years since, between San Antonio and the Rio Grande. Fine fruiting specimens also have just reached me in the collection made by this enterprising botanist last summer between San Antonio and El Paso, New Mexico. The fruit is about the size of a musket ball. Seeds ovate, acute at both ends, tuberculate.

397. Sicyos angulatus, *Linn.* Bottom woods of Comale Creek, climbing trees. May.

398. Cyclanthera dissecta, *Arn. in Hook. Jour. Bot.* 3. p. 280. Discanthera dissecta, *Torr. & Gray, Fl.* 1. p. 696. Echinocystis pedata, *Scheele in Linnæa*, 21. p. 586. Margin of woods and hedges. June, in flower. — The genus Discanthera is correctly referred by Prof. Arnott to Cyclanthera of Schrader.

399. Cucurbita perennis: radice carnoso maxima; foliis strigoso-canescentibus cordato-ovatis vel triangulatis sursum angustatis indivisis vel subsinuato-repandis margine denticulatis; calycis lobis subulatis tubo æqualibus; fructu globoso. — Cucumis? perennis, *James in Long's Exped.* 2. p. 20; *Torr. in Ann. Lyc. New York*, 2. p. 242; *Torr. & Gray, Fl.* 1. p. 543. Plains and prairies, in dry, clayey or sandy soil, near San Antonio and New Braunfels. May. — "Trailing on the ground. Root from six inches to three feet thick, fusiform, yellow inside." Fruit yellow, globose, two or three inches in diameter." — This plant has been in cultivation in the Cambridge Botanic Garden for the last two or three years, from Texan seeds. It flowers freely, and has produced full-grown fruit, which, however, has not ripened. Our plants are *diœcious*, but it is monœcious, according to Dr. James. It may be the Cucurbita fœtidissima, *H. B. K.*, as Dr. Torrey long since suggested, but that plant is said to be an annual, like the rest of the genus; besides, ours is not fetid. In its calyx, gamopetalous campanulate corolla, exappendiculate anthers, and even in the tumid margin of the seeds (although said by Dr. James to be acute) it accords with Cucurbita. Mr. Fendler met with the plant at Santa Fe; Dr. Gregg, between Saltillo and Parras, and, according to Dr. Engelmann, "Dr. Wislizenus found the same plant in the mountains of Chihuahua, with pyriform fruit."

400. C. Texana: (an C. ovifera, var.?) Tristemon Texanum, *Scheele in Linnæa*, 21. p. 586, & 22. p. 352. Margin of thickets, in moist woods, on the banks of the Upper

Guadaloupe, "apparently indigenous." September. This has also been cultivated in the Cambridge Botanic Garden. The column sometimes contains as many as four stamens. The pyriform fruit is just that of C. ovifera, of which our plant may possibly be only a naturalized variety.

401. Lagenaria vulgaris, *Seringe.* Bottom woods, Comale Creek. September. Probably early naturalized. The fruit is said to be globose.

(612.) Sicydium (an Melothriæ sect.?) Lindheimeri (*sp. nov.*): radice crassa perenni; foliis subreniformibus carnosis 3–5-lobatis partitisve et sinuato-dentatis tuberculis vel pustulis subtus prominulis scabratis ceterum cauleque glabris; pedunculo in pl. mascula atque fœminea folio breviore, masculo 3–9-floro, fœmineo unifloro; calyce fl. masc. infundibuliformi, fœm. supra ovarium longe producto anguste tubuloso, lobis petalis oblongis duplo brevioribus; bacca globosa rubra (diametro pollicari); seminibus abortu paucis turgidis rotundatis subcompressis submarginatis hilo bidentatis. — Thickets, from New Braunfels to the Liano; procumbent or climbing. June. (Also gathered in Texas, by *Mr. Charles Wright.*) — Root large and fleshy. Stems slender. Leaves succulent, from one to three inches in diameter, either moderately or deeply lobed. Flowers from one third to half an inch in length, greenish; the calyx of the sterile tubular-funnel form. Stamens 3, subsessile in the throat of the calyx; two of them bilocular, the thecæ separated by a rather broad and slightly two-lobed connective; the third of only one theca (or, as taken by some authors, 5 and triadelphous); the loculi linear-oblong, straight. Fertile flowers with the calyx-tube constricted above the globular ovary and prolonged into a rather slender beak, then funnel-form like the sterile, but bearing rather longer subulate calyx-lobes. Sterile filaments 3, short, one of them simple, the two others two-cleft, subulate. Petals, as in the sterile flower, entire, obscurely ciliate, oblong, a little narrowed below, unconnected, separately inserted into the throat of the calyx. Style a

little longer than the calyx-tube, three-cleft at the apex; stigmas fleshy, dilated, granulose-fimbriolate. Ovary three-celled, many ovuled. Berry, pulpy, "deep red when ripe, an inch or more in diameter," globose, ripening few seeds. Seeds 3 lines long, roundish-oval, turgidly lenticular. — Sicydium was founded by Schlechtendal on a small-flowered Mexican diœcious plant, of which the sterile flowers alone are known. Until the fruit of that plant is identified it must remain doubtful whether ours belongs to the same genus. This has larger blossoms, and a more elongated calyx. But it accords with Schlechtendal's incomplete description in being diœcious, in the 5-petalous corolla, and in the three distinct stamens with straight anther-cells. The leaves vary in the depth and breadth of their lobes. From the Rio Grande, Mr. Wright has communicated fragmentary specimens of what is probably a variety of the same species, with the leaves dissected into linear or filiform lobes and segments.

CACTACEÆ; by *Dr. Engelmann.*

*** Mr. Lindheimer has again sent many living specimens of Cactaceæ from New Braunfels, San Antonio, the Pierdenales, and the Llano. Among them I not only recognized all the species described in Plant. Lindh. (Boston Journal, Vol. V.) but found also a number of new forms. From other sources I have obtained other species from the lower Rio Grande. All these will be enumerated here in order to complete, as far as possible, the catalogue of the Texan Cactaceæ. A correspondence with Prince Salm Dyck, than whom none is better acquainted with these curious plants, and his examination of living specimens of most of the species, enables me to give this revision an authenticity not otherwise attainable.

MAMMILLARIA.

§ 1. *Fructu viridi, ovali; corolla persistente; testa seminum pergamentacea fusca; floribus ex axillis tuberculorum hornotinorum.*

M. CALCARATA (M. sulcata, *Engelm. Pl. Lindh. l. c.*, non *Pfeiffer*). Near *M. scolymoides*, Schdw. but sufficiently distinct, according to Prince Salm. — Rocky and hard, clayey

soil, on the Upper Guadaloupe. My specimens from there are mostly densely cæspitose; tubercles in thirteen oblique rows; proliferous groove producing the buds always near its upper end. Flowers 2 inches long and 2 to 2½ inches in diameter: sepals (or rather outer firmer perigonial leaves) 20–35: petals (inner more delicate petaloid perigonial leaves) 30–35, yellow (dirty yellow only when fading), reddish at the base.

M. COMPACTA, *Engelm. in Wisliz. Rep. not.* 32, from the mountains of Chihuahua is mentioned here only in order to add to the description of the plant that of the flower which I have had occasion to examine in the living state.—Floribus in vertice dense lanato centralibus; sepalis (17–19) lanceolatis acutis integris (rufescentibus, interioribus margine flavis); petalis (28) oblongo-lanceolatis mucronatis versus apicem denticulatis (sulphureis); stigmatibus 7–8 cuspidatis flavicantibus supra stamina (sulphurea) paulo exsertis.—Flowers at the end of June and beginning of July (in St. Louis). Flower-bud dark reddish brown: flower about 15 lines long and of the same diameter. Petals 6 lines long and 1¾ lines wide. Stigmata 2 lines long, cuspidate, as in *M. vivipara*, while all other species known to me have obtuse stigmata.

MAMMILLARIA RADIOSA (*sp. nov.*): simplex s. parce prolifera, ovata seu cylindrica; tuberculis teretibus supra plus minus sulcatis apice ex tomento albo aculeatis; áculeis rectis numerosis valde inæqualibus, plurimis (20–30) radiantibus tenuioribus albidis, centralibus 4–5 robustioribus fuscis s. rarius flavis, 3–4 sursum directis, singulo deflexo; axillis nudis, sulco subtomentoso; floribus (violaceis) ex axillis tuberculorum hornotinorum ortis sparsis (nec centralibus); sepalis petalisque lineari-lanceolatis acuminatis aristatis; sepalis (40–50) arachnoideo-fimbriatis, exterioribus brevioribus adpressis, interioribus longioribus recurvatis; petalis (30–40) integris s. basi subciliatis patentibus; staminibus (violaceis) numerossimis æqualibus; stylo longe exserto; stigmatibus 7–9 (violaceis) erectis obtusis; bacca oblonga viridi floris

rudimento coronata; seminibus fulvis ovatis scrobiculato-punctatis. — Sterile, sandy soil on the Pierdenales: flowers (in St. Louis) about the middle of June. The flowers open for three days, in direct sunshine only, and later than most other Cactaceæ, viz., from 12 or 1 till 3 or 4 o'clock. Stems 2–4 inches high, about 2 inches in diameter, dark green; tubercles in 13 oblique rows;[1] radiant spines 3–4; central spines from 4–6 lines long: flowers $1\frac{1}{2}$–$2\frac{1}{4}$ inches long, and about the same diameter when fully open, of a lighter violet color or of a splendid dark purple: stigmas deep velvety purple. — Very near *M. vivipara*, Haw., which has been found from the Upper Missouri to Santa Fe: this, however, is distinguished by its low, mostly cæspitose growth, by the smaller number of radiant spines (14–18), the absence of the deflexed central spine, the smaller *central* flowers, the apiculate stigmata, and smaller seeds: it also flowers earlier (in St. Louis about the middle of May), but, like *M. radiosa*, opens the flowers only after 12 o'clock. In *M. vivipara* the youngest tubercles produce in their axils the flowers which appear central, and remain so till after fructification, whereupon new tubercles are developed in the centre, and the young fruit is pushed aside and becomes more and more lateral. In *M. radiosa* the flower buds are also formed in the axils of the first young tubercles of the season, but are immediately pushed aside by a continuous growth of more tubercules; the buds as well as the flowers and fruits are therefore lateral. *M. vivipara* has not yet been found in Texas, though it may be expected in the mountainous regions bordering New Mexico.

§ 2. *Fructu coccineo; corolla decidua.*

* *Fructu clavato elongato; seminum testa pergamentacea,*

[1] It will hardly be necessary to mention that there are several different sets of rows of tubercles observable, but one set is usually more distinct than the others; they depend on the size of the plant, and the number, size, and closeness of the tubercles. It is well known that in different specimens of the same species they turn to either side, right or left.

fusca; caule simplici, succo lacteo; floribus ex axillis tuberculorum anni prioris.[1]

Mammillaria applanata (*n. sp.*): simplex, depressa; tuberculis elongato-pyramidatis subquadrangulatis apice ex tomento albo lanoso demum evanescente aculeiferis; aculeis rectis 15–20 tenuioribus inequalibus radiantibus, singulo centrali robustiori erecto; axillis nudis; floribus sordide albidis s. rubellis; ovario glabro, sepalis 8–13 lanceolatis; petalis 12–18 lanceolatis mucronatis, internis versus apicem fimbriato-denticulatis; stigmatibus 5–8 stamina brevia pauca flavida longe excedentibus flavis; baccis elongato-clavatis; seminibus subgloboso-ovatis scrobiculatis rugulosis parvis.—Rocky plains on the Pierdenales: flowers (in St. Louis) in May. Flowers forming a circle or wreath, in the larger specimens, of 1–1½ inches diameter around the growth of tubercles of the same year, while the scarlet fruit is frequently still persistent and forms an outer circle. Plant 2½ to 4½ inches in diameter, 1–2 inches high, with an almost level top and depressed vertex; in larger specimens 34, in smaller ones 13 or 21, spiral rows of tubercles are most conspicuous. Radiating spines 2½–6 lines long, whitish; the 3 or 4 outer or lower are stouter and very light brown; the central spines erect, or rather somewhat inclined upwards and inwards, 2–4 (mostly 3) lines long, light yellowish brown. The innermost tubercles of the preceding year appear to produce the inconspicuous flowers, which are from 9 to 12 lines long, urceolate when not fully expanded in bright sunshine. Berry 8 to 15 lines long.

Mammillaria hemisphærica (*n. sp.*): simplex, hemisphæ-

[1] It has been stated over and over again, that all the *Cactaceæ parallelæ* (with cotyledons parallel to the more or less compressed sides of the seed,) see *Wisl. Rep.* pp. 91 and 92) produce the flowers from the same year's growth, and the *Cactaceæ contrariæ* (cotyledons contrary to the compressed sides of the seeds) from that of the last preceding or former years. In *Wisl. Rep. l. c.* I have stated that some Mammillariæ probably formed an exception to that rule. What was a supposition then I have since ascertained to be the fact. These few species, however, are the only ones in which I have as yet observed this exception.

rica; tuberculis elongato-pyramidatis subquadrangulatis apice ex tomento albo brevi mox evanido aculeiferis; aculeis rectis, 9–10 tenuioribus inæqualibus radiantibus, singulo centrali robustiori porrecto; axillis nudis; floribus sordide albidis s. rubellis; ovario glabro; sepalis sub-13 lanceolatis acutis vel obtusiusculis; petalis sub-13 oblongo-lanceolatis mucronatis integris s. versus apicem denticulatis; stigmatibus 5–8 ex flavido rubellis supra stamina numerosa rubella exsertis; baccis elongato-clavatis; seminibus elongato-ovatis rugulosis minutis. — Below Matamoras, on the Rio Grande; brought home by the St. Louis Volunteers, in 1846: flowers (in St. Louis) in May. Very similar to the last species, but well distinguished by the hemispherical shape, the much smaller number of shorter spines, the less woolly areolæ, and the much smaller, less rough, and lighter-colored seed. I can see no essential difference in the flower. Body of the plant 3–4½ inches in diameter, 2–3 inches high: flowers 10–15 lines long and about the same diameter when fully open in the forenoon sun, urceolate in the afternoon. Radial spines 2, or 3–4; the central spine 2–3 lines long.

MAMMILLARIA GUMMIFERA, *Englm. in Wisl. Rep. not.* 33, has now flowered with me, and proved, as was expected, similar to the two foregoing species. I add here the description of the flower. — Floribus rubellis; ovario glabro; sepalis sub-13 oblongo-linearibus obtusiusculis fimbriatis; petalis 16 lanceolatis breviter acuminatis denticulato-erosis; stigmatibus 6 stamina brevia rubella longe excedentibus petala subæquantibus virescentibus. — Flower 15 lines long, 6–12 lines wide when fully open, brownish red outside; the petals reddish white, with dark red in the middle. Flower larger than that of *M. applanata*, much darker and more elegantly colored; style longer, etc. Fruit not seen.

* * *Fructu subgloboso; seminum testa dura nigra; caule prolifero (an semper?) succo aqueo; floribus ex axillis tuberculorum hornotinorum.*

MAMMILLARIA NUTTALLII, *Englm. in Pl. Fendl.*, from the

Upper Missouri; the only specimen I possessed was unfortunately destroyed. — Mammillaria similis, *Engelm. in Plant. Lindh. l. c.*, first discovered by Mr. Lindheimer near the Brazos, has since been found by him south of the Guadaloupe, about New Braunfels and on the Pierdenales in several forms. It has frequently flowered with me and annually produces abundant fruit. I substitute the following character and description.

M. SIMILIS: subsimplex s. plerumque cæspitosa; tuberculis ovato-cylindraceis supra plus minus sulcatis (sulco in junioribus basin versus tomentoso sæpe prolifero) axilla tomentosis; areola albo-tomentosa demum nuda; aculeis 10 – 12 rectis albidis, radiantibus tenuioribus æqualibus, centrali nullo s. singulo robustiori; floribus ex axillis tuberculorum hornotinorum subcentralibus s. demum lateralibus (flavis s. ex rubello flavicantibus); sepalis petalisque lineari-lanceolatis acuminato-aristatis; sepalis 15 – 25 ciliato-fimbriatis sæpe plus minus recurvis; petalis 20 – 30 integris s. basi subciliatis; stigmatibus 5 – 8 virescentibus supra stamina numerosissima exsertis; bacca obovato-subglobosa coccinea; seminibus nigris subglobosis scrobiculatis majoribus.

α. CÆSPITOSA: gracilior; aculeis radiantibus sub-12, centrali subnullo; sepalis 15 – 20; stigmatibus sub-5.

β. ROBUSTIOR: subsimplex; aculeis radiantibus sub-10, centrali robustiori; sepalis 20 – 25; petalis 25 – 30; stigmatibus 7 – 8. Flowers (at St. Louis) in May. — Stems 1½ – 2½ inches high, obovate, of smaller diameter; tubercles in α. 8, in β. often in 13 rows; spines 3 – 4, in β. 4 – 8 lines long; central spine, when present, 6 lines long. Grooves proliferous towards the upper or the lower end. Flowers 1½ – 2 inches long, and of the same diameter when fully open, radiating like stars with their pale yellow, silky lustre, giving this species a most beautiful appearance when several open on the same morning: petals 12 – 15 lines long and 2 lines wide. Berries 3 – 5 lines in diameter.

ECHINOCACTUS.

The specimens described in the account of Lindheimer's plants, under the name of *E. setispinus* were the most northern and rather diminutive forms of this beautiful species; the flowers were incorrectly described from a withered bud adhering to one of the specimens. Numerous plants have since been sent by Lindheimer from San Antonio, and by the St. Louis Volunteers from the lower Rio Grande.

ECHINOCACTUS SETISPINUS (*Englm. l. c.*): ovato-subglobosus s. oblongo-cylindraceus; costis 13 acutis sæpe undulatis s. subinterruptis plus minus obliquis; areolis remotis, junioribus flavido- s. albido-tomentosis; aculeis radiantibus setiformibus 10 – 16, summis longioribus imisque flavicanti-fuscis, lateralibus albidis, centrali subsingulo robustiori fusco flexuoso s. apice uncinato; floribus solitariis nudis infundibuliformibus, tubo glaberrimo; sepalis inferioribus brevioribus obtusis s. cuspidatis 25 – 40, superioribus elongatis lanceolatis 15 – 25, omnibus margine membranaceis basi auriculato-cordatis tenuiter ciliatis; petalis 20 – 30 (cum basi miniata flavis) oblanceolatis acutis integris s. denticulatis; stylo supra stamina rubella longe exserto; stigmatibus 5 – 8 sulphureis recurvis s. erectis; bacca pulposa globosa rubra rudimentis sepalorum infimorum membranaceis stipata.

α. HAMATUS: major, subovatus; aculeis radialibus 10 – 12, centrali robustiori hamato. *E. hamatus,* Muhlenpf. *E. Muhenplfordtis,* Fen.

β. SETACEUS: minor, subglobosus; aculeis radialibus 14 – 16, centralibus 1 – 3 setiformibus flexuosis. *E. setispinus,* Engelm. l. c. — Texas, from the Colorado to the Rio Grande. Flowers from April or May to October, and therefore, on account of its beautiful flower, one of the most valuable species for cultivation. — Plant 2 – 4 inches in diameter, and $1\frac{1}{2}$ – 6 or 8 inches high, flowering when quite small, simple or (in cultivation at least) sometimes proliferous at base. Var. *α* is the larger southern form, with fewer, stouter, and longer spines (radial 6 – 16 lines, central 12 – 16 lines long). Var. *β* is the

smaller, more northern form, with more and thinner spines (radial 5–10, central 12–16 lines long). Flower from 20 to 35 lines long, and 24–30 in diameter when fully open; petals then often somewhat recurved: flowers open two days, only in bright forenoon sunshine. My specimens from the Rio Grande have 5 erect stigmata and a longer flower; all the others have 6–8 spreading or even recurved stigmata and a shorter flower-tube. Berry about 4 lines in diameter. Withered flower finally deciduous. Fruit often bursting, when the filamentous red pulp and the black, thimble-shaped, verrucose seeds are seen: this pulp is formed by the clavate, elongated, twisted funiculi, which most probably form the pulp of all the soft Cactus fruits, but they do not always remain as distinct as in this species.

Echinocactus Texensis, *Hœpf.* (E. Lindheimeri, *Engelm. l. c.*) Mostly depressed, but sometimes globose. Common from the Colorado to the Rio Grande, and from thence to Saltillo (*Dr. Gregg*). Near New Braunfels it prefers the so-called Muskit-flats, or fertile level places with Muskit trees, overflowed in the rainy season. My specimens have several times fructified. Berry subglobose, pulpy, red, about 8 or 9 lines in diameter, covered with spiny bristles and soft wool, crowned by the woolly remains of the flower: seeds reniform, compressed, large, smooth and shining. Ribs in smaller specimens 13–14, in larger mostly 21, sometimes 24. Areolæ about 6 lines long, and 12 lines apart: spines from 6–10 lines long in some, 15–25 lines in others; sometimes the central spine is 2 or 3 lines broad. Flowers all open within a few days, in May (in St. Louis); unlike the last mentioned species.

CEREUS.

402. Cereus cæspitosus, *Engelm. Pl. Lindh. l. c.* Common about New Braunfels; in flower in May. — This plant has been cultivated in Europe, as Prince Salm informs me, under the name of *Echinopsis Reichenbachiana*, Hortul., and has been confounded with *C. pectinatus*: compare *Wisliz.*

Rep. Appendix, note 45. This species has also been sent from Saltillo by Dr. Gregg. Mr. Lindheimer has sent from the granitic region of the Liano a beautiful variety with chestnut brown spines ; β. CASTANEUS. — The characters given in *Pl. Lindh.* to this species have been corrected in *Wisliz. Rep. l. c.* I add here only that the fruit of this, as well as of all the other northern Cerei seen by me, ripens within a few weeks, contrary to what is observed in our Mammillariæ and Opuntiæ, and mostly bursts open longitudinally, when ripe. — I cannot omit an interesting morphological observation made on this species. The usual structure of the flower of all Cerei observed by me is the following. The ovary is covered with very short and (for the greater part) adnate sepals ; the adnate part forms a protuberance (tubercle) ; the free part is mostly very small, often only a minute deciduous scale. In the axil of the scale we find the *areola,* covered with a short tomentuma, long wool, and almost always with bristles or spines. All this together forms the *pulvillus* of authors. Next in order follow those sepals which form the tube of the flower. The lower of these are entirely similar to the sepals on the ovary. In the upper or interior sepals the tip, or free part, becomes larger and larger, more herbaceous, and finally more or less petaloid ; the wool and bristles become scarcer, but the latter longer, and are produced from an areola which is almost always situated in the axil of the sepal, where its free part separates from the common tube. Now in *C. cæspitosus,* the free upper part of these sepals of the tube is more and more elongated, somewhat terete, not foliaceous, and bears the areola with its wool and bristles just below the subulate or (in the innermost sepals) somewhat foliaceous tip, reminding us almost of the tubercles of a *Mammillaria.* The descriptions given in *Pl. Lindh.* and in *Wisliz. Rep.* have to be corrected accordingly.

CEREUS PROCUMBENS (*n. sp.*): humilis; caule subtereti s. angulato articulato ramosissimo ; tuberculis aculeiferis distinctis 4–5-fariis ; areolis parvis orbiculatis, junioribus breviter

albo-tomentosis; aculeis brevibus tenuibus albidis apice fuscis, 5–6 radiantibus, centrali singulo erecto paulo longiore; floribus diurnis; ovario tuboque brevi pulvillis sub-40 albido-villosis setas spinescentes breviores fuscas 6–9 gerentibus stipato; sepalis interioribus sub-15 lineari-lanceolatis acuminatis; petalis 18–20 oblongo-linearibus acutis mucronatis subintegris (violaceis); stigmate viridi infundibuliformi 10-partito stamina (pallide flavicantia) paulo superante. — On the lower Rio Grande, below Matamoras, collected by the St. Louis Volunteers, in 1846. — Plant spreading, 3–5 inches high: joints or branches 1½–2 inches long, ½ inch in diameter, much contracted at the base: tubercles 4 or 5 lines distant from one another, often in 4 rows, whence the plant derives a distinctly quadrangular appearance, or in 5, when it is more cylindrical. Radial spines 6, or mostly only 5, the uppermost being frequently abortive, 1–1½ lines long; central spine 1½–2 lines as long, stouter, directed upwards. Flower 3 inches long, and as wide when fully expanded, of a delicate purple color: petals 4 lines wide, often, in a bright noonday sunshine, recurved. Bristles on the tube about twice as long as the wool, below 1½–2, above 2½–3, lines long. — We have in gardens in St. Louis a similar species in cultivation, under the name of *C. Deppii*; but, as Prince Salm informs me, widely different from the true *C. Deppii*. It is not known whence it was obtained. It is distinguished from *C. procumbens* by the larger, thicker, more cylindric limbs: tubercles elevated, very distinct, in 5 or 6 rows; spines weaker and longer; 6–8 radial spines 5–6 lines long; ventral spine from 5 to 14 lines long: flower with a shorter tube, fewer pulvilli, with shorter wool, but longer and weaker bristles.

Cereus Rœmeri (*n. sp.*): ovatus, e basi ramosus; costis sub-8 (7–9) tuberculatis interruptis; areolis orbiculatis, junioribus breviter tomentosis; aculeis albidis s. flavidulis demum cinereis teretibus, radialibus sub-8, centrali singulo robustiori porrecto; floribus diu noctuque apertis infundibuliformibus, limbo erectiusculo; sepalis ovarii et tubi 17

squamosis in axillis ex tomento albo brevissimo setas spinescentes albidas 3–5 gerentibus; sepalis interioribus 8 ovato-oblongis carinatis obtusis mucronatis; petalis 10 obovato-spathulatis obtusis integris concavis chartaceis (coccineis); stylo longe supra stamina numerosissima exserto; stigmatibus 7 acutiusculis erecto-patulis viridibus. — Granitic region about the Liano: flowers (in St. Louis) in May. — Named after my friend Dr. F. Roemer, of the University of Bonn, who was the first to explore the geology of Western Texas, and brought the first specimens of this species. Sent also in numerous specimens by Lindheimer. Heads 3–4 inches high, $1\frac{1}{2}$ – $2\frac{1}{2}$ inches in diameter, single, or mostly 3–5 or even 10 from the same base; ribs interrupted: areolæ 4–8 lines distant from one another: radial spines 5–12 lines long; lateral spines longest: upper ones usually shortest; central spine 10–15 lines long. Flower open by day and night, for 4 or 5, and in cool cloudy weather as much as 6 or 7 days, 2 inches long, and one wide: petals 8–9 lines long, 5 lines wide, stiff: bristles on the tube 2–3 lines long. — The stiff and almost pergamentaceous petals are uninfluenced by sunshine or darkness like those of most other Cactaceæ. Several other northern species most probably agree in this particular, as especially *C. coccineus* and *C. triglochidiatus* of New Mexico; while other nearly related species have certainly diurnal flowers. — *C. coccineus* differs by the more numerous ribs, more numerous spines, larger and more crowded areolæ, etc. *C. polyacanthus*, Engelm. in Wisliz. Rep., has more numerous spines, and ten ribs, *C. enneacanthus*, Engelm. l. c., is larger with the tubercles less distinct, ten ribs; spines larger, angular.

Cereus variabilis, *Pfeiff.*, with its beautiful white nocturnal flowers, delighted our volunteers in their camps on the lower Rio Grande. Young plants are procumbent, with terete or rather clavate branches: adult plants several (3–10) feet high, mostly triangular, with very long and stout, or sometimes quite short spines. Fruit large, luscious, with red pulp: seeds large, smooth, shining.

OPUNTIA.

§ 1. *Applanatæ.*

O. macrorhiza (*n. sp.*): prostrata; articulis obovato-orbiculatis planiusculis; pulvillis setis fuscis et sæpe aculeis singulis binisve instructis; aculeis teretibus validis porrectis s. paulo deflexis basi apiceque fuscis ceterum albidis cum adventitio inferiore graciliore reflexo sæpe deficiente; floribus sulphureis basi intus rubellis; ovario sepalis subulatis deciduis 13 in axillis setulas fuscas brevissimas gerentibus stipato; sepalis interioribus 15–18 subulatis et (internis) ovatis acuminato-cuspidatis; petalis 8 sepala superantibus late obovato-spathulatis obtusis cuspidatis eroso-denticulatis; stigmatibus 5 obtusis, adpressis, stamina numerosa æquantibus; bacca subpulposa clavata glabrata; seminibus marginatis. — Naked, sterile, rocky places on the Upper Guadaloupe. Flowers (in St. Louis) in June. Root a large and fleshy tuber, sometimes 2 or 3 inches in diameter; joints 3–4 inches long, about $2\frac{1}{2}$–$3\frac{1}{2}$ wide, hardly attenuate at the base. Leaves subulate, about 5 lines long. Areolæ $\frac{3}{4}$–1 inch distant, more crowded toward the base and on the edges: spines (often wanting) 1 inch long, the smaller 4–6 lines long. Flower 3 inches in diameter: ovary $1\frac{1}{4}$ inch long: petals 1 inch wide, $1\frac{1}{2}$ inch long, pale yellow, red at the base. Fruit $1\frac{1}{2}$ inches long; the strongly margined seeds comparatively few, $2\frac{1}{2}$ lines in diameter. — I have found the same plant in similar situations in Western Arkansas; and it is possible that it may be one of Nuttall's new species (*O. mesacantha*, *O. cæspitosa*, or *O. humifusa*) of which I cannot find a description. — Nearly related to *O. vulgaris*.

O. intermedia, Salm. The species mentioned in *Pl. Lindh. l. c.* No. 1. has since produced abundant flowers and fruit, and proves to be the above plant. It is near *O. vulgaris*, but more erect, or ascending; the joints much larger; flowers larger ($4\frac{1}{2}$–5 inches in diameter); ovary more slender, 2–$2\frac{1}{4}$ inches long, with 20–25 subulate sepals; petals obcor-

date; stigma 5-lobed, erect; fruit $2\frac{1}{2}$ inches long, 6–8 lines wide at the top, deeply umbilicate. Lindheimer's specimens are from Industry, south of the Brazos. I believe I have seen the same species near Natchitoches on Red River.

O. Lindheimeri (*n. sp.*): erecta, robusta; caule lignoso; articulis (magnis) ellipticis basi attenuatis planis; pulvillis remotis ad margines confertioribus griseo-tomentosis, setis flavidis aculeisque paucis instructis 1–3 compressis validis deflexis varie divergentibus stramineis, nunc cum 1–2 aculeis adventitiis gracilioribus; flore . . . bacca clavata elongata subpulposa glabrata; seminibus late marginatis.—About New Braunfels. Plant erect, often 6–8 feet high: stems terete ligneous, sometimes 6 inches in diameter, with gray bark, and very light, spongy wood. Larger joints 9–12 inches long, 5–7 broad. Areolæ $1\frac{1}{2}$–2 inches distant on old joints; bristles on them 1–3 lines long. Spines all pale yellow, much compressed, indistinctly annulated, $\frac{1}{2}$–1 inch long, various; the 3 longer spines, or the one longer, with one or two shorter spines. The fruit, which Lindheimer has sent as belonging to this species, resembles very much that of *O. vulgaris*, 2–$2\frac{1}{2}$ inches long, slender, with a deep umbilicus, very different from that of the following species. Seeds 2–$2\frac{1}{4}$ lines in diameter, not numerous. Young plants grown from this seed have the same compressed spines, but are brown at the base; the lower areolæ produce no spines, but a quantity of long, coarse hair.— I add here the following species, though not properly belonging to the flora of Texas, because I suspect that it is also found at the mouth of the Rio Grande, within the limits of Texas. There, and especially on the barren sand islands at the Brazos, near Point Isabel, the St. Louis Volunteers found large and impenetrable thickets formed by an Opuntia with large joints, covered with almost globose fruits, with innumerable small seeds, and a very luscious deep red pulp. The fruit and seed are before me, but unfortunately I did not obtain a living specimen.

O. Engelmanni (*Salm. Mss.*): erecta; articulis orbiculato-

obovatis planiusculis; pulvillis remotis ad margines confertioribus griseo-tomentosis setis flavidis aculeisque paucis compressis ancipitibus instructis, 1 – 4 validis sæpe inæqualibus plus minus deflexis varie divergentibus basi rufis, ceterum stramineis cum adventitio infimo graciliore albido sæpe deficiente; fl. . . . bacca ovata subglobosa late umbilicata pulvillis pluribus tomentosis stipata; seminibus minoribus anguste marginatis. — From El Paso to Chihuahua, indigenous and cultivated, *Dr. Wislizenus.* No doubt, also, on the Texan side of the Rio del Norte. — Erect, 5–6 feet high. Upper and larger older joints 12 inches long by 9 broad. Areolæ $1\frac{1}{2}-2$ inches distant: bristles 2 – 6 lines long: spines $1-1\frac{3}{4}$ inches long, very stout. Fruit $1\frac{1}{2}-1\frac{1}{4}$ inches long, about $1\frac{1}{2}$ in diameter; umbilicus large, (10 – 12 lines) flat; pulvilli on the fruit about 5 lines distant. Seeds very numerous, about half as large in *O. vulgaris*, $1\frac{1}{2}-1\frac{3}{4}$ lines in diameter, of an irregular shape. — Near *O. Dillenii* and *O. polyantha*, as Prince Salm informs me.

§ 2. *Cylindricæ.*

O. FRUTESCENS, *Engelm. in Pl. Lindh. l. c.* under *O. fragilis*, from which it widely differs, stands near *O. gracilis*, Salm. (raised from Mexican seeds), but is sufficiently distinct. (Salm.) Fruit by the abortion of the seeds very often sterile. — I had occasion to observe this species in blossom, and add the description of the flowers:

Floribus ex ramis anni prioris provenientibus; ovario clavato basi 5-gono sepalis subulatis sub-13 stipato; sepalis interioribus 8 lanceolatis ex viridi sulphureis; petalis 8 obovato-lanceolatis cuspidatis (sulphureis s. subvirescentibus); staminibus numerosis (40 – 50) inæqualibus (externis majoribus); stylo exserto; stigmatibus 5 adpressis albidis. — The flower cannot be distinguished from that of the *Opuntiæ applanatæ*, but it is only 8 – 10 lines in diameter: ovary 9 – 12 lines long. Flowers (in St. Louis) July and August.

O. ARBORESCENS, *Engelm. in Wisl. Rep.*, is recognized by Prince Salm as identical with his *O. stellata;* but as no de-

scription of his plant has ever been published, he adopts the above name. G. E.

CRASSULACEÆ.

(245.) SEDUM SPARSIFLORUM, *Nutt.* Rocky soil, on the Upper Guadaloupe. May, June.

UMBELLIFERÆ.

† HYDROCOTYLE INTERRUPTA, *Muhl.*; *Torr. & Gray, Fl.* 1. p. 599. Swamps, along the Guadaloupe. July.

† H. UMBELLATA, *Linn.*; *Torr. & Gray, l. c.* In pools and clear streamlets on the Liano. October.

(613.) H. REPANDA, *Pers.*; *Torr. & Gray, l. c.* Near Fredericksburg, in moist places along creeks, creeping among high grass. September.

(614.) SANICULA CANADENSIS, *Linn.*; *Torr. Fl. New York*, 1. p. 265. t. 32.

403. ERYNGIUM LEAVENWORTHII, *Torr. & Gray, Fl.* 1. p. 604. Margin of woods, on clayey prairies, Comale Creek and San Marco. August. — Plant annual, ornamental in cultivation, when the heads turn red or purple.[1]

[1] Lamarck first properly distinguished from Eryngium aquaticum, *Linn.*, the var. β., and characterized it as a distinct species, under the name of *E. Virginianum.* Later, Michaux, giving to the original *E. aquaticum* of Linnæus the name of *E. yuccæfolium*, described under the name of *E. aquaticum*, a plant which appears to be, not the *E. Virginianum* of Lamarck (which is described as only a foot or so in height, with long and narrow, ensiform, radical leaves, finely striate and ciliate, with distant spinules, Lamarck moreover citing the figure of *Pluk. Alm. t.* 396), but the much larger and broader-leaved plant which Elliott has well characterized under that name. Elliott's *E. Plukenetii* is truly *E. Virginianum*, Lam. I am indebted to H. W. Ravenel, Esq., of St. Johns, Berkley, S. Carolina, for full specimens and notes, accurately distinguishing these species, and another, which perhaps has also been confounded with *E. Virginianum*, but which may properly bear the name of this acute and zealous botanist, who has directed my attention to its characters. The latter should stand next *E. aquaticum, L.*

1. E. RAVENELLII (*sp. nov.*): caule simplici; foliis linearibus elongatis *complicato-equitantibus subteretis* nervulosis obsolete denticulatis, involucralibus trifidis capitulo æqualibus; paleis receptaculi uninervatis æqualiter 3-spinosis calycis lobos mucronato-acuminatos superantibus.—In flat and damp Pine land; common at Black Oak, St. Johns, Berkley District, South Carolina. September, October. — Stem from 1½ – 3 feet high, slender. I possess no strictly radical leaves; those from near the base of the stem are from 12–18 inches long, conduplicate in the dried plant, and

(615.) Cicuta maculata, *Linn.* Banks of Comale Creek. July. Plant 4 to 7 feet high.

404. DAUCOSMA, *Engelm. & Gray.*

Calycis dentes 5 subulati, persistentes. Petala obovata, emarginata, cum lacinula apice emarginato-biloba inflexa. Stylopodium conicum, persistens; stylis elongatis reflexis. Fructus ovoideus, ala angustissima crassa cinctus: mericarpia jugis 5 crassis obtusis (in fruct. juniore subduplicibus aut dorso exaratis). Valleculæ univittatæ: commissura plana bivittata; vittis latis rectis. Semen semiteres. Carpophorum bipartitum.—Herba annua, glabra, odore forte Dauci (unde nomen); caulibus 2–3-pedalibus ramosis striatis farctis; foliis ternati–quinatisectis, segmentis tripartitis, lobis laciniatis venosis lanceolatis, seu fol. supremorum lineari-setaceis; involucri et involucelli phyllis plurimis 3–5-partitis setaceis

3 or 4 lines wide at the base, thence tapering gradually to the apex. Ravenel describes them from the living plant as "*terete*, solid, but soft and spongy, with a deep groove in the upper surface, and a few obsolete spinulose serratures." He remarks, that "the tube of the calyx is not entirely clothed with lanceolate vesicles," as in *E. Virginianum*, etc.; but I find that this character is not uniform. The paleæ of the receptacle are larger; their three spiny cusps stronger and of equal length, and the calyx-lobes much less pointed than in *E. Virginianum*, but more so than in *E. aquaticum*.

2. E. Virginianum (*Lam. Dict* 4. p. 759): caule simplice vel apice cymoso; foliis lineari-lanceolatis planis, inferioribus venulosis subspinuloso-serratis dentibus uncinatis, radicalibusve fere integerrimis, superioribus spinulosis seu laciniatis, involucralibus trifidis vel 3–5-cuspidatis capitulo fructifero subæqualibus; paleis receptaculi trinervatis, tricuspidatis, cuspide medio longiore lobos calycis fructiferi acuminato-aristatos subæquantibus.—E. lacustre Virginianum, &c., *Pluk. Alm.* t. 396, f. 3. E. aquaticum *β. Linn.* E. Plukenetii, *Ell. Sk.* 1. p. 582. Wet places, margin of ponds and streams, New Jersey to Florida and Texas. Flowers in August and September in the Northern States; in July and June farther south. Plant one or two feet high.

3. E. præaltum: caule 4–6-pedali superne ramoso; foliis lanceolatis planis venosis serratis utrinque attenuatis, radicalibus magnis longe petiolatis costa valida, summis linearibus spinuloso-dentatis incisisve, involucralibus capitulo 2–3-plo longioribus; paleis receptaculi trinervatis breviter tricuspidatis lobos calycis fructiferi subulato-acuminatos vix æquantibus.—E. aquaticum, *Michx. Fl.* 1. p. 163, non *Linn.* E. Virginianum, *Ell. Sk.* 1. p. 343, non *Lam.*—In tide swamps, S. Carolina and Georgia; August. Michaux states he found it especially on Goose Creek, a tributary of Cooper River, in the tide swamps of which it was gathered by Mr. Ravenel. The lowest leaves are from one to two feet in length, and from 2½–3 inches in breadth, not unlike those of a Rumex in appearance, on petioles a foot or 18 inches in length. The paleæ are nearly as in *E. Virginianum*.

radios umbellæ et umbellularum plurimos subæquantibus; floribus albis. — Genus differt a proximo Cynosiadio petalis inflexis, ab Æthusa calyce 5-dentato, ab Œnanthi carpophoro distincto, etc.

404. DAUCOSMA LACINIATUM, *Engelm. & Gray.* High valleys near New Braunfels and on the Upper Guadaloupe, covering large patches of moist prairie land, and along the margin of thickets. Flowering in July. — The specimens have only half grown fruit. The carpological characters of the genus are derived from fruiting specimens of Lindheimer's collection in 1849, just received, and from others gathered by Mr. Wright the same year, on sand bars of the upper part of the Nueces. — The whole plant exhales a strong odor of Carrot.

(616.) CHÆROPHYLLUM TEINTURIERI, *Hook. & Arn.*: β. fructu pubescente, *Torr. & Gray, Fl.* 1. p. 638. Shady woods, New Braunfels. April, May. "Less rigid and erect than the form with glabrous fruit, from the same locality." [1]

[1] From Mr. Wright, gathered in Western Texas, we have specimens of an evident congener of Tauschia nudicaulis, except that its fruit shows about 20 small vittæ, instead of six rather large ones. In this and many other respects, it accords with Musenium, *Nutt.*, of which I have no specimens (since No. 220 of Geyer's Oregon Collection does not agree with the generic character).

TAUSCHIA (MUSENIOPSIS) TEXANA (*sp. nov.*): glaberrima; foliis omnibus radicalibus utrinque viridibus pinnato-decompositis, nempe pinnis 3–5 cum impari, inferioribus petiolulatis (petiolulis ac petiolo gracili apteris) pinnato-3-5-partitis, segmentis cuneiformibus 3-5-fidis, lobis oblongis obtusissimis; scapo simplicissimo nudo; involucro parvo 1-2-phyllo aut nullo; involucello dimidiato e phyllo unico palmati 3-5-fido; radiis umbellulæ fructu didymo brevioribus; mericarpiis lævigatis 18-20-vittatis, jugis obsoletis. — Western Texas, near Austin? *Mr. Charles Wright.* — Root thick, perennial. Scape in fruit from 5 to 8 inches high, longer than the leaves. Umbel 5-7-rayed. Fruits a line and a half long, very smooth; the filiform jugæ nearly obsolete at maturity. — No. 120 of Coulter's Mexican Collection is Tauschia nudicaulis, as appears from an original specimen from Schlechtendal, in flower only. No. 121 is apparently a distinct species, viz.:

TAUSCHIA COULTERI (*Gray & Harv. ined.*): breviter caulescens; foliis ternati-quinatisectis subtus glaucescentibus; segmentis ovalibus basi subcordatis cuneatisve sæpius trilobatis duplicato-dentatis, dentibus mucronatis; involucro et involucello e phyllo unico lineari integerrimo aut nullo; radiis umbellulæ fructu plus duplo longioribus. — Scapes in flower and fruit from 5 to 12 inches long, soon exceeding the leaves. Petioles much dilated and sheathing at the base, as in *T. nudicaulis.* The larger leaflets an inch and a half long. Pedicels in fruit 4 or 5 lines in length. Fruit fully two lines long; the jugæ rather prominent; vittæ 6 in each mericarp, rather large.

405. Atrema Americana, *DC. Prodr.* 4. p. 250. Margin of woods, in rocky, dry prairies, New Braunfels. May.

LORANTHACÆ.

406. Phoradendron flavescens, *Nutt.; Engelm. in Pl. Fendl.* p. 59, in not.: var. β. pubescens, *Engelm. Mss.* On Muskit trees, Upper Guadaloupe, Elms, &c.[1]

[1] Dr. Engelmann communicates the subjoined revised character and remarks.

"Phoradendron flavescens (*Nutt.*): ramis teretibus; foliis oblanceolatis obovatis nunc orbiculatis obtusis in petiolum brevem attenuatis trinerviis; spicis masculis subverticillatis folium æquantibus, articulis 4-5, 15-35-floris; fœmineis suboppositis folio brevioribus, articulis 3-4 4-10-floris; floribus depresso-globosis annulato-carinatis ciliatis subtrifidis. — Var. α. glabriusculum: foliis oblanceolatis seu obovatis 3-nerviis in petiolum sensim attenuatis glabris; ramis junioribus puberulis: — β. pubescens: foliis ut in α, sed puberulis; ramulis canescentibus: — γ. orbiculatum (Ph. orbiculatum, *Engelm. Pl. Fendl.*): foliis obovato-orbiculatis in petiolum brevem abrupte contractis vix trinerviis subpubescentibus.— New Jersey to Southern Missouri and New Mexico, and south to Texas. Var. α. is the more northern form, mostly in low woods along water courses; β. in damp places on Ulmus, Algarobia, and also Quercus falcata, near New Braunfels, San Antonio, etc. γ. in Texas and Arkansas on dry sterile land, on Quercus nigra and other Oaks. Flowers, December to March; fruit ripens the following winter.

"The nearly related *Phoradendron tomentosum*, from South of the Rio Grande, has smaller leaves, longer spikes, etc. *Phoradendron villosum* of Oregon has much smaller and spatulate tomentose leaves, etc.

"I take this opportunity to make some corrections and additions to my paper on *Viscum* and the related genera, printed as a note in *Plantæ Fendlerianæ*, pp. 58, 59.

"I. VISCUM. . . . . . . Bacca globosa, pulposa, semipellucida, monosperma, corolla persistente coronata.

"II. PHORADENDRON, *Nutt.* Flores diœci, globosi. *Fl. masc.* Perianthium 3-(raro 2- s. 4-) lobum: antheræ loborum basi adnatæ, transversæ, biloculares, poris s. rimis verticalibus duabus dehiscentes. *Fl. fœm.* Perianthium 3-(rare 2-s. 4-)-lobum: ovarium inferum, tubo adnatum, uniloculare; ovulo unico pendulo. Stigma sessile, plus minus bilobum. Bacca globosa, pulposa, semipellucida, monosperma, perigonio persistente coronata. — Frutices Americani, etc.

"* *Foliosa*; foliis lamina dilatata basi attenuatis; spicis fœmineis plus minus elongatis ex articulis pluribus plurifloris constitutis.

"1. Phoradendron flavescens, *Pursh*, sub Visco. Vide supra.

"2. Ph. tomentosum, *DC.*, sub Visco.

"3. Ph. villosum, *Nutt.*, sub Visco: tomentosum; ramis teretibus; foliis oblanceolatis s. spathulatis obtusis in petiolum brevem attenuatis obscure trinerviis s. subenerviis; spicis fœmineis oppositis s. verticillatis abbreviatis 2-3-articulatis; bracteis truncatis; articulis brevibus, inferiore 6-8-floro, superiore 2-floro; floribus depresso-globosis annulato-carinatis puberulis 3-fidis. — Wahlamet Woods, Oregon, *Nuttall.* — Leaves 8-12 lines long, 3-4 lines wide. Spikes 3-4 lines long. Flowers 0.5-0.6 of a line in diameter, like those of the two foregoing species de-

CAPRIFOLIACEÆ.

† LONICERA ALBIFLORA, *Torr. & Gray, Fl.* 2. p. 6. Var. *β.* tubo corollæ limbo paulo longiore aut æquali. L. anelica, *Lindh. ined.* — High rocky prairies between the

pressed, with an almost annular, ciliate carina. Stigma conspicuously bifid. — The narrow, long, attenuate leaves and the short spikes distinguish it from *Ph. tomentosum.*

"5. PH. LANCEOLATUM, *Engelm. in Plant. Fendl.*

"* * *Squamosa;* foliis in squamulas connatas pelviformes reductis; spicis fœmineis ex articulis paucis 1–2 floris constitutis.

"6. PH. CALIFORNICUM (Nutt.): glabrum; ramis elongatis strictis gracilibus teretibus; squamis ovato-lanceolatis patentibus basi connatis tenuiter ciliatis; spicis fœmineis lateralibus oppositis 3–4-floris; floribus globosis trifidis glabris in quovis articulo singulis s. binis cupulæ ciliatæ immersis; spicis fructiferis elongatis; baccis globosis. — Sierra Nevada of California, on some species of Strombocarpus, *Dr. Gambel.* Intermediate and connecting the leafy and scaly species of this genus, though properly belonging to the latter. Scales longer than the diameter of the branch, patulous. Branches a foot or more long (Nuttall); ultimate joints 7–9 lines long; flowering spikes about 3 lines, and fruiting spikes 9 lines long. Fruit 3 lines in diameter. Flowering spikes with 2 lateral linear-lanceolate ciliate bracts at base, consisting of 3 joints, the lower being always sterile, the two upper ones producing each two or by abortion single flowers. In the fruit-bearing spike these joints are in such a manner elongated that the (typically axillary) fruit is carried up to the top of the joint, just below the next pair of leaves (or scales). Stigma globose, very slightly bilobed.

"7. PHORADENDRON JUNIPERINUM, *Englm. in Plant. Fendl.*

"III. ARCEUTHOBIUM, *M. Bieb.* Flores diœci, ovati, compressi. *Fl. masc.* Perianthium 3- (raro 4-) partitum. Antheræ lobis mediis adnatæ, unicellulosæ, rima transversa dehiscentes. *Fl. Fœm.* Perianthium breviter pedicellatum, 2- (raro 3-) dentatum: ovarium inferum, tubo adnatum, uniculoculare; ovulo unico pendulo. Stigma sessile, conicum. Bacca carnosa, opaca, ovata, compressa, perigonio persistente coronata. — Frutices gerontogei et Americani glaberrimi, aphylli, articulati; foliis squamæformibus in vaginulas pelviformes s. cupuliformes connatis; floribus axillaribus terminalibusque sæpe spicam simplicem s. compositam mentientibus; fl. masculis 1–3 sessilibus, *fœmineis plerumque singulis brevissime* incluso-pedicellatis; baccis perigonio aucto plerumque discolore coronatis sæpius exserte pedicellatis extus carnosis intus viscidis.

"1. A. OXYCEDRI (*M. Bieb.*): caule ramisque oppositis s. dichotomis compresso-teretibus gracilibus strictis; ramulis ultimis compresso-sub-quadrangulatis; squamis triangularibus in vaginulas pelviformes connatis; floribus fœmineis in ultimis ramulorum articulis axillaribus terminalibusque in quavis axilla singulis s. binis; baccis exserto-pedicellatis, erectis. — Southern Europe, etc. The specimen before me is from Fiume. — Lowest joints of the ultimate branchlets sterile; the next joint producing two leaf buds; the 2 to 4 following joints bearing flowers, one of which is terminal. The usual state probably is, where only the two last joints bear flowers, the ultimate one a terminal, and the next below two lateral flowers; that is the state described by Decandolle; 'floribus fœmineis ad ramulorum apices tribus.' But in the specimen before me most branchlets bear from 5 to 9 flowers,

Guadaloupe and Pierdenales. Comanche Spring. April. "A rough, unsightly shrub, from 4 to 6 feet high; only the young shoots show any inclination to climb or twine. Flow-

on the three or four last joints, one or two in each axilla. Flowers minute, 0.3 of a line wide and 0.4 long, on very short, enclosed pedicels, which apparently are elongated immediately after flowering. Pedicel of the young fruit (ripe fruits not seen) half the length of the fruit.

"2. A. Americanum (*Nutt.*): caule ramisque fasciculatis teretibus gracilibus patulis; squamis truncatis in vaginulas dilatatas cupuliformes connatis; floribus masculis axillaribus terminalibusque nec spicàtis. — Oregon, on Pinus, *Nuttall.* — Considerably resembling the slender forms of var. α. of the next species, but smaller, slenderer, and at once distinguished by the terete branches, the fasciculated branchlets, and much dilated vaginulæ. Female plant and fruit unknown to me.

"3. A. campylopodum (*n. sp.*): ramis oppositis seu dichotomis compresso-quadrangulatis; squamis truncatis breviter cuspidatis in vaginulas subcylindricas cupuliformes connatis; floribus axillaribus terminalibusque plerumque in spicam simplicem s. compositam aggregatis; masculis singulis vel binis ternisve, fœmineis in quavis axilla singulis; baccis exserto-pedicellatis patulis s. recurvis. — Var. α. macrarthron: caule compresso vix angulato; ramis plerumque gracilioribus; articulis plus minus elongatis; floribus fœmineis sparsis et in ramulis brevibus paucis seu in spicas simplices aggregatis. — β. ? brachyarthron: caule tereti robusto; ramis robustis articulis abbreviatis diametro vix longioribus; floribus fœmineis in spicas densas compositas aggregatis. — I have comprised under this name different forms, which, when better known, will probably have to be separated as distinct species. My specimens are so incomplete that I can not even satisfactorily determine whether the different forms which constitute the first of the two varieties will finally be retained under one species. — Var. α. has been found in Oregon (only on Pinus ponderosa), *Geyer;* in New Mexico (only on Pinus edulis,) *Fendler*, 282; and in California, *Douglas.* — The specimens from New Mexico (only male and female flowers seen) have short female spikes, bearing 2 to 5 flowers, or the flowers are scattered on the branchlets: the flowers are elliptical, 0.4 lines wide and 0.5 long, almost sessile. Geyer's Oregon plant (I have seen only a fruiting specimen) has more elongated many-flowered female spikes; the flowers apparently ovate; pedicel hardly one third the length of the (not quite ripe) fruit. The Californian plant (male and female flowers and fruit) is much stouter: male flowers twice as large as in the specimens from New Mexico, and not rarely 4-parted; female flowers in more elongated spikes, elliptico-orbicular, small, 0.4 to 0.5 line in diameter; the recurved pedicel more than half the length of the fruit, which is 2 lines long and 1, 3 wide. — Var. ? β. has been collected in Mexico by Coulter. I can hardly doubt it to be a distinct species; but my means to distinguish it are at present too limited. The stout terete stem, the short joints which are hardly longer than wide, the crowded compound or panicled spikes which resemble those of the following species, and the larger ovate (not elliptical) flowers appear to indicate specific distinction. Fem. flowers 0.6 lines wide and 0.8 lines long: fruit 2 lines long and 1.2 lines in transverse diameter, the pedicel more than half as long as the fruit: male flowers not seen.

"4. A. cryptopodum (*n. sp.*): caule ramisque acute quadrangulatis robustis articulis brevioribus; squamis truncatis in vaginulas cupulatas connatis; floribus in spicas densas compositas congestis, fœmineis ovatis in quavis axilla singulis;

ers dirty white." — Mr. Wright has sent the same plant from near Austin. The leaves on the flowering branches are from an inch to an inch and a half long; those of young sterile shoots larger. Tube of the corolla 5 lines long. — I possess no specimen of the original *L. albiflora*; from which this apparently differs only as the L. flava β. *Torr. & Gray, l. c.* differs from the type of that species.[1]

RUBIACEÆ.

(617.) GALIUM VIRGATUM, *Nutt. in Torr. & Gr. Fl.* 2. p. 20: var. caulibus laxioribus. — New Braunfels; "covering large patches of naked prairie, mixed with little grass. April. To this species plainly belongs the Galium Texanum, *Scheele in Linnæa*, 21. p. 597, gathered by Rœmer.

(618.) G. TRIFLORUM, *Michx.*: forma pusilla, junior, foliis subspathulatis. New Braunfels. April.

(619.) G. UNCINULATUM, *DC. Prodr.* 4. p. 600? G. Californicum γ. Texanum, *Torr. & Gray, Fl.* 2. p. 20. New Braunfels. April. Allied to this is G. hypadenium, *Schauer.*

(247.) DIODIA TRICOCCA, *Torr. & Gray, Fl.* 2. p. 30. Sterile soil in high places, near New Braunfels. June.

(620.) HEDYOTIS (AMPHIOTIS) STENOPHYLLA, *Torr. &*

baccis brevissime incluso-pedicellatis erectis. — Santa Fe, only on Pinus brachyptera, *A. Fendler*, No. 283. — Hooker's *A. Oxycedri* from the Hudson Bay country appears to belong here: the figure shows at least subsessile, erect fruits; but the segments of the male flowers are broadly oval, while those of the New Mexican plant are lanceolate." G. ENGELMANN.

[1] From the collection made by Lindheimer in 1849, Dr. Engelmann communicates the following:

SYMPHORICARPUS SPICATUS (*Engelm. Mss.*): foliis obovatis obtusis brevissime petiolatis supra demum glabratis subtus pubescentibus pallidis; floribus (15 – 30) in spicas axillares arcte glomeratas congestis; corollis intus barbatis; baccis rubris. — Shady bottom woods, New Braunfels. A small shrub, 2 or 3 feet high, with numerous slender branches. Leaves about three fourths of an inch long, half an inch wide; the lower leaves wider, almost orbicular. Spikes from 4 to 6, or in fruit 8 or 10, lines long. Flowers a little smaller than in *S. glomeratus*, to which our species bears a strong affinity. It is, however, distinguished by its smaller, obtuse leaves, the spiked flowers, the larger and apparently more juicy fruit, and the broader, more compressed seeds. Of the numerous flowers in each spike only a few mature fruit." *Engelm.*

Gray, Fl. 2. p. 41. Var. corollis minoribus. — Rocky soil on the plateau above New Braunfels. June.

(621.) HEDYOTIS (HOUSTONIA) HUMIFUSA (*n. sp.*): annua, dichotome ramosissima, depressa, glutinoso-puberula; foliis lineari-lanceolatis imis in petiolum attenuatis mucronatis crassiusculis; stipulis dilatatis scariosis setaceo-dentatis; floribus in dichotomiis solitariis binisve breviter pedunculatis; tubo corollæ infundibuliformis lobis oblongis supra puberulis sublongiore lacinias calycis 4-partiti subulato-setaceas paulo superantibus; capsula pendula didyma puberula basi tantum calyci accreta; seminibus in loculis paucis ovoideis. — Open gravelly banks of streamlets, near Fredericksburg. May. (Also in sandy prairies at Austin, *Mr. Charles Wright.*) — Stems 3 or 4 inches long, fastigiate, very leafy, in cultivation (in the Cambridge Botanic Garden) close pressed to the ground, and forming a dense patch, flowering through the summer. Lower leaves somewhat spatulate, an inch long; the others linear and smaller. Corolla pale purple or nearly white, 3 lines long; the lobes more or less downy inside. Stigma two-lobed. The flowers are diœcio-dimorphous, after the manner of the genus and its allies; one plant having the linear anthers deeply included, and a long style with the stigma exserted; the other with a short, included style, and with the stamens inserted in the throat of the corolla. Both forms are abundantly fertile. The seeds are not hollowed on the inner face. — This species is intermediate in characters between Houstonia, Amphiotis, and Ereicotis, and should perhaps stand in a separate section, along with *H. rubra*, although the latter is in some respects quite a different plant. I was mistaken in stating (in *Pl. Fendl.* p. 61), that *H. rubra* had been met with in Texas. No. 621 is the form with subexserted stamens, and short style.

(622.) The same species with subexserted style and included stamens. Sandy prairies on the Pierdenales. May.

407. FEDIA (VALERIANELLA) STENOCARPA (*Engelm. Mss.*): fructu glabro anguste oblongo, loculis sterilibus paral-

lelis semine multo minoribus: cæt. F. radiatæ sed fructu minore. — Thickets in light soil, near San Antonio, New Braunfels, &c. March. This, Dr. Engelmann, probably with good reason, considers as distinct from the *F. radiata* with glabrous fruit (the form that alone occurs around St. Louis.) "The fruit is not only much smaller and more slender than that of *F. radiata*, but the proportion of the empty cells is different; these being much smaller than the seed; while in the former they are about equal, and in *F. carinata* (which has a different habit) larger. Cauline leaves often deeply dentate at the base, or almost pinnatifid, but sometimes entire." *Engelm.*[1]

COMPOSITÆ.

408. VERNONIA LINDHEIMERI: perennis, bipedalis; foliis anguste linearibus confertis sessilibus uninerviis margine revolutis supra glabris punctatis subtus cauleque simplici sericeo-tomentosis; capitulis corymbosis breviter pedunculatis 30–40-floris; squamis involucri cano-tomentosi pappo rubiginoso brevioribus conformibus appressis oblongis obtusis exappendiculatis; acheniis glabris 10-costatis glandulosis; pappo exteriori multisquamellato. *Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 46. — Rocky hill sides, and high rocky plains, near New Braunfels, &c. July, August. Also near Seguin, &c. *Mr. Wright.* A very well-marked and handsome species. In cultivation in the Cambridge Botanic Garden, it does not blossom until near the end of September.

[1] From the collection of 1849, Dr. Engelmann has communicated the characters of another species, viz.

FEDIA AMARELLA (*Lindh. Mss.*): "glaberrima, erecta, versus apicem dichotomo-cymosa; foliis inferioribus spathulatis basi longe attenuatis, superioribus oblongo-linearibus sessilibus vel basi subcordatis, omnibus integris obtusis; fructibus minimis subgloboso-ovatis obtuse auriculatis hispidis, loculis sterilibus fertili subgloboso multo angustioribus brevioribusque pene obliteratis. — Comanche Spring; flowering in May. — Plant 8 to 12 inches high, in habit similar to *F. radiata* and *F. stenocarpa*; but the leaves are entire in all the specimens; and the fresh herb has a bitter taste, which the other species have not. The fruit is much smaller than in any other species known to me; the sterile cells many times smaller than the seed, their cavity almost obliterated." *Engelm.*

The appropriate name of *V. rosmarinifolia*, given to this species by Mr. Lindheimer, is preoccupied by Lessing.

409. Clavigera Riddellii, *Torr. & Gray, Fl.* 2. p. 77. Gravelly banks of the Upper Pierdenales, and of the Guadaloupe. September, October. — Plants 3 or 4 feet high, suffruticose.

410. Kuhnia eupatorioides, *Linn.* β. corymbulosa: forma humilis. K. suaveolens, *Fresenius.* K. Maximiliani, *Sinning in Neuwied, Trav.* Dry, rocky prairies near New Braunfels. November. Also, Comanche Spring, "with beautiful red or yellow flowers." *Lindh.*

411. K. eupatorioides, δ. gracillima: foliis angustissime linearibus marginibus revolutis seu filiformibus. Dry, gravelly bed of the Pierdenales and Cibolo Rivers. October. — The same as No. 305 of *Pl. Fendlerianæ* (also found by *Mr. Wright* on the Rio Grande), but with still narrower leaves. It would seem to be distinct from K. eupatorioides γ. *Torr. & Gray*; yet I find no characters besides the more attenuated leaves. I notice that it is the Kuhnia leptophylla, *Scheele in Linnæa*, 21. p. 598, described from Lindheimer's specimens.

† Liatris punctata, *Hook. Fl. Bor. Am.* 1. p. 206. t. 55. *Torr. & Gray, Fl.* 2. p. 69. Var. β. Rocky prairies between the Rio Colorado and Guadaloupe. July.

412. Brickellia (Bulbostylis) cylindracea: cinereo-pubescens et resinoso-atomifera, herbacea e radice lignea; foliis plerisque oppositis triplinerviis subtus reticulato-venosis oblongo-ovatis obtusiusculis grosse serratis brevissime petiolatis, ramealibus subsessilibus; capitulis pedunculatis in paniculam foliosam laxe corymbosam digestis; involucri 10-flori cylindrici squamis 4-seriatim imbricatis arachnoideo-ciliatis striatis mucronato-acuminatis, intimis linearibus pappum barbellato-serrulatum æquantibus, exterioribus multo brevioribus ovalibus appressis; achæniis puberulis. *Gray & Englm. in Proceed. Amer. Acad. l. c.* — In stony thickets on the Upper Guadaloupe. September, October. Also near Fredericks-

burg; and in the same region, by *Mr. Wright.* — Stems numerous, from a woody perennial root, two to four feet high. Heads 7 lines long. — Differs from *Clavigera* only in the merely serrulate pappus. Can it be C. dentata, *DC.?*

413. EUPATORIUM AGERATIFOLIUM, *DC.*, β. TEXENSE. *Torr. & Gray, Fl.* 2. p. 90. — E. Lindheimerianum, *Scheele, in Linnæa*, 21. p. 599. Rocky, Cedar woods, New Braunfels. October. Also gathered by *Mr. Wright* in Western Texas. — A shrubby plant, with slender branches, from four to ten feet high. In the cultivated plant the copious and showy blossoms are pure white.

† E. SEROTINUM, *Michx.* Margin of woods, New Braunfels. August.

† ASTER SERICEUS, *Vent. Hort. Cels.* t. 33. Banks of the Upper Pierdenales. October.

(249.) A. DRUMMONDII, *Lindl.; DC. Prodr.* 5. p. 234; *Torr. & Gray, Fl.* 2. p. 121. Thickets, on rocky banks of the Upper Pierdenales. October.

† A. MULTIFLORUS, *Ait.; Torr. & Gray, Fl.* 2. p. 124. Dry prairies of the Upper Guadaloupe and Pierdenales. October.

A. VIRGATUS, *Ell. Sk.* 2. p. 253; *Torr. & Gray, Fl.* 2. p. 116. Thickets on the Cibolo River. October.

† A. CARNEUS, *Nees.; Torr. & Gray, Fl.* 2. p. 133. Upper Pierdenales. October, 1845.

† A. CARNEUS. *Nees.* Var. foliis angustioribus linearibus. On the Pierdenales.

(624.) A. CARNEUS β. SUBASPER, *Torr. & Gray, l. c.* Thickets and along streamlets, on the Pierdenales and Liano. October.

† A. SIMPLEX, β. *Torr. & Gray, Fl.* 2. p. 132. Rocky soil, margin of thickets. October.

† A. DIVARICATUS, *Torr. & Gray, Fl.* 2. p. 163. On the Pierdenales and Liano; in moist, fertile soil. Stems 2–4 feet high, sometimes leafless. Rays light blue.

(623.) A. SPINOSUS, *Benth. Pl. Hartw.* p. 20; *Torr. &*

Gray, Fl. 2. p. 165. Banks of the Liano. October. Also on the Brazos. "Shrubby, 6 to 8 feet high; the perennial stems half an inch thick, branching above [the branches herbaceous]. Leaves few and small, [scale-like or subulate], spinescent or soft, or none." *Lindh.*

(626.) Erigeron Canadense β. glabratum. E. strictum, *DC.! Prodr.* 5. p. 289, sed panicula composita expansa. Prairies north of the Liano, among granite rocks. October. — De Candolle's *E. strictum* is certainly not to be distinguished as a species from *E. Canadense*.

(627.) E. modestum, *Gray, Pl. Fendl. in Mem. Amer. Acad. n. ser.* 4. p. 68. Distasis modesta, *DC., Prodr.* 5. p. 279? Rocky soil, north of New Braunfels, and near the sources of the Pierdenales. June and October. — The squamellæ and the fragile setæ of the pappus are more numerous than in the character of Distasis modesta, *DC.* Our plant is an undoubted *Erigeron*. Had it more numerous rays it would fall into the section *Phalacroloma,* before *E. tenue.* As it is, it belongs rather to *Pseuderigeron.*

414. Egletes ramosissima, *Gray, Pl. Fendl.* p. 71. Aphanostephus ramosissimus, *DC. Prodr.* 5. p. 310. A. Riddellii, *Torr. & Gray, Fl.* 2. p. 189. Dry, sandy, or stony prairies of the Guadaloupe and Pierdenales. April to August. — In cultivation this plant flowers abundantly through the whole summer, and is quite ornamental. The heads droop before anthesis; and the white rays are usually tinged with pink or purple underneath.

415. Keerlia bellidifolia (*Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 47): annua, diffusa, hirsutulo-pubescens; caulibus foliosis dichotomo-ramosis; ramis ramulisque monocephalis; foliis spathulatis obtusis mucronulatis integerrimis, summis sublinearibus, omnibus inferne attenuatis, radicalibus obovatis petiolatis; involucri campanulati squamis biserialibus oblongis membranaceis nitidis mucronato-acuminatis marginibus late scariosis; ligulis (cyaneis) 9–14 lineari-oblongis; fl. disci plusquam 20 plerisque fertilibus; acheniis clavato-

fusiformibus vix compressis 7–9-nerviis hirtellis coronula integra sæpius obsoleta superatis.—Margin of woods and thickets, in sterile soil, Comale Creek and near New Braunfels (also 628.) April to June. A summer state, very much branched and with smaller capituli, was gathered in Western Texas by *Mr. Wright.* The plant has much the aspect of *Bellis integrifolia*, though the heads are rather smaller, and it branches diffusely in the same way, the branches terminated by single capituli.—The type of the genus *Keerlia* must be K. ramosa, *DC.*, a Mexican plant collected by Keerl himself, and with which the present plant appears to be a true congener. K. linearifolia, *DC.* is thought to have yellow rays, which leaves its position doubtful. K. skirrobasis, *DC.*, and of Delessert's as well as of Hooker's figure, is doubtless Leucopsidium Arkansanum, *DC.*, the Egletes Arkansana, *Nutt.*, as I have already remarked in *Proceed. Amer. Acad. l. c.*, and in *Plantæ Fendlerianæ*, p. 71. The genus, as it thus stands, takes the place in this country of *Brachycome*, from which, as well as from *Bellis*, it is well distinguished by its flat receptacle. Mr. Lindheimer's recent collection enables us to add another Texan species, of a peculiar aspect, and remarkable for its fewer-flowered heads, its flattened ray-achenia, and entirely sterile disk,[1] viz.

[1] An amended character of the genus is subjoined:—

KEERLIA, *DC. Prodr.* 5. p. 309. excl. sp. 2. et forte 1.

Capitulum multiflorum radiatum; ligulis 6–25 uniserialibus fœmineis; fl. disci hermaphroditis vel abortu masculis 5-dentatis. Involucrum campanulatum aut turbinatum, pauci–pluriseriale; squamis oblongis mucronatis vel acuminatis margine late scariosis. Receptaculum planum nudum. Achenia subteretia vel compressa, disci omnia aut centralia sæpe inania. Pappus parvus coroniformis.—Herbæ Mexicanæ et Texanæ, humiles, ramosæ; foliis alternis sessilibus integris; capitulis parvulis solitariis vel paniculatis; ligulis albis vel cæruleis.

§ 1. Achenia subteretia, fusiformia vel obpyramidata, nervosa: styli fl. disci appendice brevi obtusa superati.—Caules dichotome ramosi, ramis apice nudis monocephalis, capitulis multifloris.

1. K. RAMOSA, *DC.* 2. K. BELLIDIFOLIA, *Gray & Engelm. supra.* ?K. LINEARIFOLIA, *DC.*

§ 2. Achenia radii plano-compressa calloso-marginata, disci omnia inania gra-

(629.) K. EFFUSA (*sp. nov.*): perennis? caule virgato ad apicem usque folioso hirsuto; foliis utrinque hispidis oblongis obtusis integerrimis e basi lata arcte sessilibus, infimis subspathulatis basi attenuatis, costa supra impressa subtus prominula; panicula decomposita patentissima, ramulis pedunculisque filiformibus; bracteis minimis subulatis; involucri turbinati squamis gradatim imbricatis oblongis marginibus scariosis obtusissimis cuspidato-mucronatis; ligulis albis 5–7 oblongis; fl. disci 7–10 sterilibus; acheniis radii plano-compressis ovalibus calloso-marginatis ad margines præsertim hirtellis faciebus fere enerviis apice acutatis pappo minimo setuloso-coroniformi superatis, disci omnibus abortivis gracilibus, pappo ut in radio. — Shady declivities, on the banks of the Upper Guadaloupe, near Comanche Spring. August, September. Stem from 18 to 30 inches high, very leafy to the top; the leaves about an inch long, not unlike those of *Aster patens*, but not clasping. Heads very numerous: involucre scarcely more than two lines long.

416. GYMNOSPERMUM CORYMBOSUM, *DC. Prodr.* 5. p. 312; *Torr. & Gray, Fl.* 2. p. 192. Rocky and naked limestone terraces between the headwaters of the San Antonio and Guadaloupe rivers. August – October. — The leaves are nearly lanceolate.

(80.) GUTIERREZIA TEXANA, *Torr. & Gray, l. c.* New Braunfels, in large masses on sterile soil. July, August.

417. SOLIDAGO SPECIOSA γ. RIGIDIUSCULA, *Torr. & Gray*: foliis angustioribus, capitulis majusculis. S. Lindheimeriana, *Scheele in Linnæa*, 21. p. 599. On limestone gravel in the dry bed of the Cibolo, between New Braunfels and San Antonio. October.[1]

cilia: styli fl. disci steril. appendice gracili lanceolata hispida superati. — Caulis strictus, panicula polycephala composita, pedunculis pedicellisque filiformibus patentissimis, capitulis paucifloris.

3. K. EFFUSA: vide *supra*. — Like Brachycome, which it represents in America, *Keerlia* as thus constituted exhibits both terete and compressed achenia.

[1] Solidago cylindrica, *Scheele in Linnæa, l. c.*, from Virginia, appears to be S. speciosa β. angustata, *Torr. & Gray.*

† S. NEMORALIS, *Ait.; Torr. & Gray, Fl.* 2. p. 220. Prairies, Upper Pierdenales. October.

† S. INCANA β? *Torr. & Gray, Fl.* 2. p. 221. On declivities, Upper Pierdenales. October.

† S. DECEMFLORA, *DC. Prodr.* 5. p. 332. Prairies, Upper Pierdenales. October. — This, if rightly identified, must stand next to *S. Radula*, from which it differs in having considerably larger heads, narrower involucral scales, and cinereous entire triplinerved leaves. — It has been abundantly collected at Comanche Spring, in October, 1849.

(253.) ISOPAPPUS DIVARICATUS, *Torr. & Gray, Fl.* 2. p. 239: pedunculis brevioribus. On granite along the Liano. November.

† APLOPAPPUS SPINULOSUS, *DC.; Torr. & Gray, l. c.* Var. segmentis foliorum rachique filiformi-setaceis. Sandy soil under Muskit bushes, on the Liano.

(630.) CENTAURIDIUM DRUMMONDII, *Torr. & Gray, Fl.* 2. p. 246. Dry, rocky prairies on the Liano. November. — Raised from Texan seeds in the Cambridge Botanic Garden, this proves to be a very showy plant. Its numerous, golden yellow rays are fully an inch in length. The radical and lowest cauline leaves are strongly laciniate-pinnatifid or even bipinnatifid.

418. GRINDELIA SQUARROSA, *Dunal; DC. Prodr.* 5. p. 314. G. Texana, *Scheele, in Linnæa,* 21. p. 60. Stony prairies, New Braunfels. August. Plant 2 to 4 feet high, branching above; the heads nearly an inch in diameter, larger, indeed, than ordinary for *G. squarrosa*, to which, however, it clearly belongs.

(631.) CHRYROPSIS HISPIDA, *Hook. Fl. Bor.-Am.* 2. p. 22; *Torr. & Gray, Fl.* 2. p. 255. Var. STENOPHYLLA: foliis lineari-spathulatis. On the Liano growing, from strong ligneous roots, in the crevices of smooth granite rocks. November.

419. C. CANESCENS, *Torr. & Gray, Fl.* 2. p. 256. Rocky prairies, on the Comale and Upper Guadaloupe. June – August.

(625.) Baccharis Texana, *Gray, Pl. Fendl.* p. ~5. Linosyris Texana, *Torr. & Gray, Fl.* 2. p. 232. Dry, granitic prairies, and on granite rocks on the Liano; often exclusively covering large patches. November.

(634.) B. angustifolia, *Michx. Fl.* 2. p. 125; *Torr. & Gray, Fl.* 2. p. 258. pl. masc. Banks of the Liano, in granitic gravel. October.—Shrub 6 to 10 feet high. The larger leaves are three inches long, two or three lines wide, and beset with a few salient teeth. *Mr. Wright* gathered the same plant on the Rio Grande, along with *B. cœrulescens.* It seems to be the *B. angustifolia;* but it is remarkable that it should occur so far inland.

(635.) B. angustifolia, *Michx.:* pl. fœm. fructifera. With the preceding.

(420.) Pluchea camphorata, *DC.; Torr. & Gray, Fl.* 2. p. 261. Var. involucris floribusque rubescentibus. Banks of Comale Creek, in clayey prairie soil. September. (Some few specimens of *P. fœtida* are distributed under this number.)

(421.) Filaginopsis multicaulis, *Torr. & Gray, Fl.* 2. p. 263. Dry prairies, New Braunfels, &c. April.[1]

(632.) A variety of the last, from the same region, more branched and depressed, the chaff all woolly.

(633.) Diaperia prolifera, *Nutt.; Torr. & Gray, Fl.* 2. p. 264. Evax prolifera, *Nutt. in DC. Prodr.* 5. p. 459. Dry prairies, New Braunfels. April.

(422.) Amphiachyris dracunculoides, *DC. Prodr.* 5. p. 313; *Torr. & Gray, Fl.* 2. p. 192. Gutierrezia Lindheimeriana, *Scheele in Linnæa,* 22. p. 351. Rocky prairies of the

[1] It is hard to say upon what plants (from a Texan collection, made by Rœmer,) Mr. Scheele has founded two new species of Filago, viz. Filago repens, and F. Texana, *Scheele in Linnæa,* 22, p. 164. If they are rightly described as having "Flosculi centrales tubulosi perfecti pappo capillari instructi," they are not our species of *Filaginopsis,* nor *Diaperia.* We know of no indigenous North American *Filago* this side of California, nor of any naturalized species except *F. Germanica.* It may be seen, moreover, that no great reliance can be placed on this writer's determinations.

Guadaloupe, north of New Braunfels, in large patches. September.

(636.) Melampodium cinereum, *DC. Prodr.* 5. p. 518; *Gray, Pl. Fendl.* p. 78. M. leucanthum, *Torr. & Gray, Fl.* 2. p. 271. Roc y declivities, Upper Pierdenales. May — October. — The plant is ornamental in cultivation, and bears a profusion of blossoms through the whole season.

(637.) Polymnia Uvedalia, *Linn.*; *Torr. & Gray, Fl.* 2. p. 273. Bottom woods of the Guadaloupe. September. "Rays short, rarely seen." But plants raised from the seeds in the Botanic Garden, develop rays of nearly the usual size for this species.

423. Berlandiera Texana, *DC. Prodr.* 5. p. 517. Margin of woods, in dry, stony soil, New Braunfels. May.

424 (638). Lindheimera, *Gray & Engelm.*

Capitulum multiflorum, monoicum; floribus radii 4–5 ligulatis, fœmineis, ad axillas squamarum involucri interiorum sitis; fl. disci circiter 20, tubulosis, sterilibus. Involucrum duplex; exterius e squamis 4–5 laxis linearibus foliaceis; interius totidem membranaceo-foliaceis oblongis planis disco longioribus. Receptaculum planum, paleis chartaceis ovaria sterilia amplectentibus onustum, binis exterioribus basi cujusque squam. inter. invol. adnatis, persistentibus. Ligulæ ovales, breviter tubulatæ, involucrum vix superantes: corolla disci 4–5-dentata. Styli fl. ster. filiformes, indivisi, hispidi. Achenia radii ovalia, obcompresso-plana, marginato-alata, intus subcarinata, carina apice in dentem parvum reflexum producta, alis in pappum 2-dentatum extensis; disci abortiva. — Herba monocarpica, erecta, scabro-hispida; caule dichotomo; pedunculis subcymoso-paniculatis gracilibus monocephalis; capitulis nutantibus; foliis imis alternis grosse dentatis, cæteris oppositis sessilibus oblongo-ovatis basi hinc inde dentatis, summis pedunculisque glandulis patelliformibus

conspersis. Flores aurei. — Genus eximium, Berlandieræ et Engelmanniæ cognatum, diximus in honorem ejus acerrimi inventoris, qui floram Texanam largiter indagavit.

424. L. Texana, *Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 47. In thickets and rocky Cedar woods, New Braunfels; also Comanche Spring, &c. (638). Also gathered in Western Texas by *Mr. Wright.* This has been cultivated now for two seasons in the Cambridge Botanic Garden as an annual: it copiously produces its neat flowers through the summer, and until killed by autumnal frosts.

† Silphium laciniatum, *Linn.* Prairies and open woods, New Braunfels. July.

425. Engelmannia pinnatifida, *Torr. & Gray, Fl.* 2. p. 283. E. Texana, *Scheele in Linnæa,* 22. p. 155. Upper Guadaloupe, on rocky hillsides, and in dry and hard prairie soil. April.

(639.) E. pinnatifida; var. foliis majoribus submembranaceis. Comanche Spring, and New Braunfels.

426. Parthenium Hysterophorus, *Linn.; Torr. & Gray, Fl.* 2. p. 248. Muskit Flats, near San Antonio, and in the streets of that town. April to October.

427. Iva angustifolia, *Nutt. in DC. Prodr.* 5. p. 529; *Torr. & Gray, Fl.* 2. p. 279. Comanche Spring, &c., in rocky, moist soil, and in the dry bed of streams, in large masses. "Used in brewing beer, in place of hops."

428. Ambrosia aptera, *DC. Prodr.* 5. p. 527. A. trifida β. Texana, *Scheele in Linnæa,* 22. p. 156. Low grounds, New Braunfels. August. Closely allied to *A. trifida,* but readily distinguished by the marginless petioles, terete stems, and the quite different fruit. The fruit is much smaller, generally 8-ribbed, and merely 4–6-tuberculate.

429. A. coronopifolia, *Torr. & Gray, Fl.* 2. p. 291; var. asperula, capitulis minoribus, fructibus interdum 6-tuberculatis. A. Lindheimeriana, *Scheele in Linnæa,* 22. p. 156. Moist prairies, near New Braunfels. August.

430. A. CORONOPIFOLIA, var. gracilis, foliis minus divisis, capitulis minoribus. A. glandulosa, *Scheele, l. c.* p. 157. In the gravel of the dry bed of the Cibolo. September.

(640.) FRANSERIA TENUIFOLIA, *Gray & Harv. in Pl. Fendl.* p. 80; var. TRIPINNATIFIDA: segmentis foliorum crebris brevioribus. — Mountain prairies of the Liano, along the margin of thickets. November. — This pretty clearly belongs to the same species as the plant which Fendler collected at Santa Fe; but all the lower leaves are tripinnately parted, their segments shorter and broader; and only the upper bipinnately parted leaves have the terminal lobes prolonged. The fertile involucre, in the specimens examined, is only one-celled and one-flowered; and so it sometimes is in Fendler's specimen. It is, like that, minutely scabrous-pubescent, and the spines, which are more developed and more numerous than in Fendler's plant, but much shorter than in *F. Hookeriana*, all have uncinate points.

431. HALEA TEXANA, *Gray, Pl. Fendl.* p. 83. Tetragonotheca Texana, *Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 48. Tetragonosperma lyratifolium, *Scheele in Linnæa,* 22. p. 167. Upper Guadaloupe and Cibolo Rivers, on rocky ridges. April. Also gathered by *Mr. Wright.* — In cultivation here it blossoms through the summer. The minute pappus is apt to escape notice, except in the living plant.

(94.) ECHINACEA ANGUSTIFOLIA, *DC.* On the Pierdenales, Comanche Spring, &c. May. "Root very pungent. Flowers somewhat fragrant."

† RUDBECKIA BICOLOR, *Nutt.* Pierdenales. June. In cultivation, the brown-purple color is commonly obsolete or wanting on the ligules of all the later heads.

(641.) DRACOPIS AMPLEXICAULIS, *Cass.; DC. Prodr.* 5. p. 558; var. ligulis basi atropurpureis. On the Pierdenales. June.

(642.) LEPACHYS COLUMNARIS β. PULCHERRIMA, *Torr. & Gray, Fl.* 2. p. 315. Rich, clayey prairies, New Braunfels. June.

432. ALDAMA UNISERIALIS. Gymnopsis uniserialis, *Hook. Ic. Pl.* t. 145; *Torr. & Gray, Fl.* 2. p. 317. Shady woods, On Comale Creek. June — August. In this and the allied species, united by De Candolle with Gymnolomia, *H. B. K.*, under the common name of *Gymnopsis*, "the remarkable manner in which the fertile achenia of the disk are inclosed in the paleæ of the receptacle, like those of the ray-flowers in *Melampodium*, seems fully to warrant the retaining or them Llave and Lexarsa's generic name, *Aldama.*" *Benth. Voy. Sulph.* p. 116.

433. SIMSIA (BARRATTIA: achenia calva glabra) CALVA. Barrattia calva, *Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 40. Rocky hills and terraces, often under shrubby live oak, along the Guadaloupe and Pierdenales. July – October. — Root fleshy, perennial. Size and number of the rays very variable. — The discovery of an allied species with a slightly biaristulate or bidentate pappus, as described in *Plantæ Fendlerianæ*, p. 85., invalidates the character of the genus Barrattia, which we had established on this plant. Although the want of a pappus would refer it to a different Candollean division of *Heliantheæ*, it cannot now be generically distinguished from the genus *Simsia*.

† VIGUIERA BREVIPES, *DC. Prodr.* 5. p. 578. Rocky hill tops, on the Upper Guadaloupe. October. — The same form was collected in Western Texas by *Mr. Wright*. It agrees with the character in the *Prodromus*.

434. V. BREVIPES, *β.* foliis plerisque rhomboideo-ovatis membranaceis. V. Texana, *Torr. & Gray, Fl.* 2. p. 318. Helianthella latifolia, *Scheele in Linnæa*, 22. p. 160. Margin of woods and on bushy slopes, New Braunfels. July – October.

(96.) HELIANTHUS CUCUMERIFOLIUS, *Torr. & Gray, Fl.* 2. p. 320. New Braunfels. — This is probably H. Lindheimerianus, *Scheele in Linnæa*, 22. p. 159. But it is not perennial.

(259.) HELIANTHUS LENTICULARIS, *Dougl.; Torr. & Gray, Fl.* 2. p. 319. Prairies on the Guadaloupe. July.

(643.) Actinomeris (Achæta) Wrightii, *Gray, Pl. Fendl.* p. 85. Upper Guadaloupe, at Pinta's Crossing, on rocky soil, in open woods. June.—Plant 1–3 feet high, with few branches and heads, rigid.

† Coreopsis Drummondii, *Torr. & Gray, Fl.* 2. p. 345. Bottom woods near Victoria. February.

† C. tinctoria, *Nutt.; Torr. & Gray, l. c.* Margin of woods and praries, Comale Creek; common. July.—The plant, No. 441, noticed under 397, in *Pl. Fendlerianæ* as *C. tinctoria*, is not that species, but C. cardaminefolia, *DC.*, which species we have also in cultivation, from Texas.

435. Bidens chrysanthemoides, *Michx.; Torr. & Gray, Fl.* 2. p. 352. Banks of streams, New Braunfels. October.

436. Lipochæta Texana, *Torr. & Gray, Fl.* 2. p. 357. Naked hills and margin of woods, New Braunfels and Upper Guadaloupe. June–September.—Ray-achenia three-angled, more or less three-winged; the conspicuous wings of the lateral angles confluent at the summit; the ventral wing narrow, dilated at the summit. Achenia of the disk narrowly two-winged at the apex. Awns fragile, thickened at the base and united with the confluent, firm, chaffy scales.

(644.) Hymenatherum Wrightii, *Gray, Pl. Fendl.* p. 89. Sandy soil, in Post-Oak woods, on the Pierdenales. June.

437. (646.) AGASSIZIA, *Gray & Engelm.*

Capitulum globosum, multiflorum, radiatum; ligulis fœmineis nunc difformibus. Involucrum disco brevius, circa biseriale; squamis exterioribus lineari-oblongis appendicula spathulata vel obtusa foliacea patente instructis, intimis lineari-acuminatis. Receptaculum globosum, alveolatum; alveolis valde dentatis fimbrilliferis. Ligulæ cuneatæ, palmato-3–4-fidæ, sæpe irregulares seu tubuloso-difformes, vestigia staminum gerentes. Corolla disci Gaillardiæ, dentibus triangulari-lanceolatis. Styli rami ligularum lineares, subulato-apiculati; fl. disci ad basin appendicis brevissimæ nudæ clavato-obtusæ penicillati! Achenia turbinata, sericeo-villosissima. Pappus

radii et disci conformis, e paleis 9 hyalinis ovatis uninerviis constans, nervo in aristam capillarem corollam adæquantem longe producto. — Herba biennis, acaulis; radice fusiformi; foliis varie 1 – 2-pinnatifidis, nunc sinuatis lyratisve; scapo 1 – 2-pedali, toto nudo, monocephalo. Capitulum Gaillardiæ, speciosum. Flores suaveolentes, disci flavi et purpurei, radii rubescentes vel atrorubri.

437. A. SUAVIS, *Gray & Engelm. in Proceed. Amer. Acad.* 1. p. 50. Gaillardia odorata, *Lindh. ined.* G. simplex, *Scheele in Linnæa*, 22. p. 160. Rocky prairies, near San Antonio and New Braunfels. April and May (646). — The genus is very near *Gaillardia*, from which it is distinguished by the fertile but usually deformed rays, the globose and alveolate receptacle, and by the style, the branches of which are tipped with a penicillate tuft, but not prolonged into a filiform hispid appendage; and the habit is peculiar. The flowers are deliciously sweet-scented, the fragrance much like that of the Heliotrope; the short rays are cherry-red or dark purple, and yellow only at the tip, as in several species of *Gaillardia;* the earliest heads are rayless. The leaves vary from lyrate-pinnately parted, with linear segments, to obovate and barely-toothed or incised towards the base. — Agassizia, *Chavannes*, is Galvesia, *Dombey*. Agassizia, *Spach*, is Sphærostigma, *Seringe*, and Holostigma, *Spach*, by most authors received only as a subgenus of Œnothera.

(103.) GAILLARDIA PICTA, *Don.* Near Victoria. More upright, and the deeply incised rays more cuneate than in the plant from Galveston.[1]

438. HYMENOPAPPUS CORYMBOSUS, *Torr. & Gray, Fl.* 2. p. 372. H. Engelmannianus, *Kunth. in Ann. Sci. Nat.* 3 *Ser.* 11. p. 229. (April, 1849) ex char. Prairies and margin of woods, in fertile, rather heavy soil, New Braunfels, &c. April, May. Biennial.

[1] I cannot make out what Gaillardia tuberculata, *Scheele, l. c.* p. 349, (described from Roemer's collection) can be; neither G. Rœmeriana, *Scheele, l. c.* p. 161, unless it be *Actinella scaposa.*

(645.) Helenium autumnale, *Linn.:* var. foliis rigidis. Grassy banks of Streamlets, Fredericksburg. October.

439. Actinella scaposa, *Nutt.; Torr. & Gray, Fl.* 2. p. 382. Gaillardia Rœmeriana, *Scheele in Linnæa,* 22. p. 161? Rocky prairies, Victoria and San Antonio. February – May.

(648.) A. linearifolia, *Torr. & Gray, Fl.* 2. p. 283. On sterile, rocky soil, New Braunfels. May. Prairies on the Pierdenales, in patches, on sandy soil. June.

(647.) Marshallia cæspitosa, *Nutt. in DC. Prodr.* 5. p. 680. (*Pl. Lindh. supra,* No. 110.) Var. caule folioso! Rocky soil on the Upper Guadaloupe. April.

(649.) Achillea Millefolium, *Linn.:* var. floribus roseis. Post Oak openings, on the Pierdenales. June.

440. Artemisia dracunculoides, *Pursh. Fl.* 2. p. 521; *Torr. & Gray, Fl.* 2. p. 416. In patches, near New Braunfels. October.

441. A dracunculoides, var. foliis infimis trifidis vel incisis. Dry prairies, Upper Guadaloupe. September.

† A. caudata, *Michx. Fl.* 2. p. 129; *Torr. & Gray, Fl.* 2. p. 417. Sandy prairies of the Upper Pierdenales. October.

442. A. Ludoviciana, *Nutt. Gen.* 2. p. 143; *Torr. & Gray, Fl.* 2. p. 420. A. cuneifolia, *Scheele in Linnæa,* 22. p. 162. Dry and high prairies, especially on old ant hills. September.

443. A. vulgaris δ. Mexicana, *Torr. & Gray, l. c.;* var. foliis superioribus integerrimis angusto-lanceolatis linearibus supra glabris. (A. Lindheimeriana, *Scheele in Linnæa,* 22. p. 163.) In patches in dry praries near New Braunfels. September. — The specimens accord with Texan ones of Drummond, cited in the Flora of North America. It is one of the forms that connect *A. Ludoviciana* with *A. Vulgaris.*

444. A. vulgaris δ. Mexicana, *Torr. & Gray, l. c.* Nearly the same form as the last; the lower leaves all fallen; the upper entire. Dry bed of the Cibolo. September.

† Gnaphalium polycephalum, *Michx.* New Braunfels, &c.

445. Senecio aureus ε. Balsamitæ, *Torr. & Gray, Fl.* 2. p. 442. High, rocky plains, Upper Guadaloupe. March.

† S. Riddellii, *Torr. & Gray. Fl.* 2. p. 444. Rocky hill-tops, between the Upper Guadaloupe and the Pierdenales, and in open Post-Oak woods. October.

446. Leria nutans, *DC. Prodr.* 7. p. 42. Cedar woods, in rocky soil, New Braunfels. March.

447. Apogon gracilis, *DC.! Prodr.* 7. p. 78. In patches, on high, rocky prairies, New Braunfels. April. — Larger in all its parts than the ordinary *A. humilis*, and perhaps to be distinguished from it.

448 (& 650). Pinaropappus roseus, *Less. Syn.* p. 143; *DC. Prodr.* 5. p. 99. Troximon Rœmerianum, *Scheele in Linnæa*, 22. p. 165. High, rocky prairies, between Bexar and New Braunfels. April. Ligulæ white, a little reddish on the back. Roots penetrating very deeply.

(651.) Lygodesmia aphylla *β.* Texana, *Torr. & Gray, Fl.* 2. p. 485. Calcareous soil, New Braunfels. May. — It often bears a tuber at the apex of the long root. The marginal achenia are more or less attenuated upwards, as is also the case in the Florida plant.

*** No. 337, "*Linum Boottii γ. rupestre*, p. 155, is certainly a distinct species, as Dr. Engelmann had stated. It may be characterized as follows: —

337. Linum rupestre (*Engelm. ined.*): perenne, glaberrimum; caulibus e radice lignescente plurimis strictis gracilibus (1–2-pedalibus) striato-angulatis superne corymboso-paniculatis; foliis lineari-subulatis mucronulatis; glandulis stipularibus conspicuis post lapsum foliorum persistentibus; pedicellis calyce subbrevioribus; sepalis ovatis cuspidato-acuminatis margine glanduloso-ciliatis petalis flavis multoties brevioribus; filamentis sterilibus dentibusque plane nullis; stylis a basi discretis; capsula ovato-globosa calycem æquantibus, loculis bilocellatis. — Growing from the crevices of naked rocks, New Braunfels, also gathered at Comanche Spring,

July, 1849, in fruit. The leaves fall away early from the fructiferous plant, leaving the conspicuous stipular glands. Petals one third of an inch long. Capsule scarcely over a line in diameter.

The collection of 1849 furnishes an undescribed Passiflora, viz.: —

Passiflora affinis (*Engelm. Mss.*): "herbacea, scandens, elata, glabra; foliis trilobis subtus glaucis petiolisque eglandulosis, inferioribus subcordatis, superioribus basi subacutis, lobis subæqualibus obovatis obtusis setaceo-mucronatis integris; stipulis setaceis; pedunculis binis petiolum æquantibus vel superantibus 3-bracteatis, cirrho intermedio elongato simplici; petalis calycis lobis obtusis brevioribus et angustioribus (flavescentibus); baccis (cæruleo-atris) stipitem æquantibus. — Comanche Spring, climbing high over trees, in shady places. August – September. — Near *P. lutea* in aspect; from which it is distinguished by the bracteate peduncles, the deeply lobed leaves, the larger flowers, smaller seeds, &c. Lower leaves 3 inches long, and 4 wide, less deeply lobed than the upper, which are deeply divided. Petioles 4 – 12 lines long. Peduncles 12 – 15 lines long. Bracts 3, rarely 2, subulate, oblanceolate, or obovate, mucronate, often distant. Flowers 16 lines in diameter; the fimbrillæ as long as sepals. Stipe half an inch in length, longer in proportion than in any other of our species. Berry of the same diameter. Seeds ovate, mucronate, transversely rugose, smaller and more turgid than in *P. lutea*. — De Candolle's division of the genus, which would separate this species from *P. lutea* on account of the bracts, must be erroneous; moreover, *P. lutea* has not "perigonium s. calycem 5-lobum, but 10-lobum, as well as our species." — *Engelm.*

[To be continued.]

The following brief account of the region in which the present collection of plants was made, drawn up by Dr. Engelmann as a preface to this article, having been received too late to take its proper place, is here subjoined.

"In November, 1844, Mr. Lindheimer left the neighborhood of the Brazos River, where he had made his collections in 1843 and 1844, and reached in January, 1845, the shores of the Matagorda Bay. In this and the following month he collected on the lower Guadaloupe. From thence he went up this river about one hundred miles. Here, where the Comale Creek empties into the Guadaloupe, the Association of German emigrants, with whom he had for the present joined his fortunes, selected a place for settlement, and laid the foundation of New Braunfels, now a flourishing town, and the county seat of Comale county.

"The year 1845 was spent in exploring the country and making excursions in the mountainous region to the west and northwest, at that time very insecure, being the haunts of wild Indian tribes.

"In the following year, 1846, Mr. Lindheimer made large collections in the interesting country about New Braunfels, at the same time giving much of his time and attention to the affairs of the colony.

"The explorations of the year 1847 were extended northwest to the country watered by the Pierdenales River, where another German settlement, Friedrichsburg (or Frederiksburg), had been founded. Collections were made partly here and partly near New Braunfels. Late in the fall an excursion in a northern direction into the granitic region of the Liano river furnished some interesting plants not observed before.

"The year 1848 was spent principally on the Liano, where several new German settlements had been formed. But the country appeared to be less rich in botanical treasures than had been expected; the burning sun of the summer months had almost destroyed the vegetation on the granitic soil, not refreshed for months by any rains. The Comanches, Weckos,

Tonkeways, and other Indian tribes of the west of Texas, became troublesome, and the frontier settlements had to be abandoned.

"The spring of 1849 found Mr. Lindheimer farther south, at Comanche Spring, one of the headwaters of San Antonio River. He has now (in the spring of 1850) returned to New Braunfels, where he intends again to go over the as yet insufficiently explored country, the most diversified and richest in botanical treasures as yet seen by him in Texas.

"The collections now distributed comprise those made in 1845 and 1846 (fascicle III) and 1847 and 1848 (fascicle IV).

"I proceed now to give a short geographical and topographical sketch of the country explored by Mr. Lindheimer.

"Matagorda Bay, with its numerous branches, receives to the northeast the Colorado, one of the largest rivers of Texas. Southwest of the Colorado the smaller Guadaloupe River empties into the same bay after receiving not far from its mouth its southern branch, the San Antonio River. The headwaters of these rivers, together with the southern branches of the upper Colorado, drain the country investigated by Mr. Lindheimer since 1845.

"The coast of the bay itself forms a level saline plain, sandy with comminuted shells. Cakile, Œnothera Drummondi, and Teucrium Cubense are characteristic plants: a little farther off are found Berberis trifoliolata, Acacia Farnesiana, a shrubby Erythrina, groves of Sophora speciosa, Condalia, some large Yuccas, and large Opuntias with humbler Cactaceæ beneath them.

"Some miles higher up the rivers, on clayey soil, solitary Elms and Palm trees are seen; the prairies have a stiff, black soil thickly matted with grass. The prevalent tree now becomes the Live Oak along the rivers, as well as in small groves on the prairies: higher up on the rivers the Water Oak and the Spanish Oak (Q. falcata) are found mixed with the Live

Oak. Swampy places are often densely covered with Marsilea macropoda, like fields of clover.

"Ten to twenty miles from the coast the country rises into the "rolling prairies." Along the rivers Quercus macrocarpa, Taxodium distichum, and Carya olivæformis constitute large forests of vigorous growth. The groves of the prairies are principally formed by Sophora speciosa, Condalia obovata, and Diospyros Texana. The prairies themselves are richly studded by flowers, among which the blue and fragrant Lupinus Texensis and different species of red and yellow Castilejas are most conspicuous.

"About one hundred miles from the coast the country becomes hilly; conglomerate rocks are frequently seen; the streams are more rapid and clear and often expose horizontal strata of cretaceous rocks. Elm and Cypress are the principal trees along the rivers; Sycamores, Linden, and Hackberry are sparsely mixed with them. Many curious shrubs, among them the Ungnadia, are found in these river-forests. Here, also, the Muskit trees (Algarobia) make their first appearance, indicating the region of the Arborescent Mimoseæ; they form open woods, where the level ground, often overflowed in the rainy season, brings forth abundance of the thin and wiry but nutritious "Muskit grasses" (Aristida, Atheropogon, and others). Many other interesting plants are found in these "Muskit-flats."

"In this region, and at the base of the first plateau, are located the towns of San Antonio, New Braunfels, and Austin, in a delightful climate, where snow or ice are rarely seen, and where the summer heat, tempered by the sea-breezes, never becomes uncomfortable. The spring, which at the coast sets in in January and early February, commences here a month or six weeks later. During the summer the weather is usually dry, and the vegetation languishes, but the rains of the latter part of August and September soon cause the whole country again to be clothed in fresh verdure.

Many plants then bloom a second time; some, indeed, in this fertile climate, bloom oftener than that, almost after every period of rains.

"A short distance north of this region, steep and sterile declivities, covered by loose rocks, rise to the first plateau, just mentioned. The high plains which are now reached are mostly sterile and stony, and often large faces of naked rocks are exposed. Many interesting plants mentioned in this catalogue, are peculiar to these plains: the smaller Cactaceæ, Echinocactus setispinus, Cereus cæspitosus, several Mammillariæ, and prostrate Opuntiæ grow here; different species of Yucca are common; the curious and stately Dasylirion is here first met with. The trees of this region are Elms and Cedar among the rocks, and Cedar again, finely developed, along the banks of the streams, where Cercis occidentalis, the shrubby Red Bud, forms thickets. Juglans fruticosa and Morus parvifolia are here found; the Live Oak dwindles down to a shrub; and low bushes of Vitis rupestris, the mountain grape, cover large tracts of these plains.

"Twenty to thirty miles farther northwest the country rises again and becomes more hilly, and regular conic or pyramidal elevations, often showing the horizontal strata of the cretaceous limestone exposed in naked terraces, rise one behind the other, producing many peculiar plants. The valleys between them are often wide, with a thin soil, covered with grass and often with sparse Post Oaks; or they are narrower, without any timber, but more fertile. The springs are here numerous and beautifully limpid, of a temperature of about 67 or 68 degrees; the streams clear and rapid. The beds of the larger watercourses are often entirely dry in summer, leaving a wide, stony, or pebbly bed or naked rocks, abounding with interesting plants. The banks of the deeper streams are thickly covered with stately Cypress trees.

"A few miles north of the Pierdenales the first outlier of the granitic formation is seen, which is found extensively developed on the Liano. The vegetation here begins to show

analogies to that of New Mexico. Here the winters are pretty cold, the springs late, the summers excessively hot, the soil generally thin, and therefore the prospects of the settlers unfavorable.

"I add a few details of localities and distances, which may not be found on the common maps.

"Green Lake and Caritas River are in the low lands near Matagorda Bay. Victoria is a town a little higher up on the lower Guadaloupe. New Braunfels on the Comale Creek and Guadaloupe River, is about one hundred miles to the northwest of the Bay, twenty-five miles northeast of San Antonio, and forty-five miles southwest of Austin, the present capital of Texas. The road from New Braunfels to San Antonio crosses the Cibolo, one of the confluents of San Antonio River, which runs in a wide and pebbly, and often dry bed. The Salado, one of the heads of which is the often-mentioned Comanche Spring, is another branch of San Antonio river, and such, farther south, are the Leona and the Medina.

"In going west from New Braunfels we reach, fifty-five miles from that town, the upper waters of the Guadaloupe, the so-called Guadaloupe crossings on the Pinto-trail. Several small streams in this neighborhood, Spring Creek, Wasp Creek, Three Creeks, and Sabinas (or Cypress Creek) are often mentioned as localities of different plants.

"North of this the road crosses several high ridges, (where, among other plants, Guajacum angustifolium, and in deep, clear ponds Chara translucens, were discovered,) and reaches, sixty miles from the Guadaloupe, the Pierdenales, one of the branches of Colorado River. The town of Friedrichsburg is built near the Pierdenales in a rather barren, sandy region, thinly scattered with Post Oaks.

"About thirty-five miles north of this the granitic region of the Llano or Liano is reached. The San Saba runs thirty miles farther north.

"The Flora of the country east of the Brazos River bears

considerable resemblance to that of the southern United States. But south of the Brazos, and still more south of the Colorado, the character of the vegetation changes; it assumes the peculiarity of the flora of the Rio Grande valley, which I have tried to characterize in Wislizenus's Report. The flora of the Rio Grande connects the North American with the Mexican flora, and has also many peculiar plants of its own, some of which have for the first time been distributed in Lindheimer's collections: such are the interesting Rutosma, the only American Rutacea known; Galphimia linifolia, the most northern Malpighiacea; several shrubby Mimoseæ; an evergreen Rhus; Sophora speciosa; the Eysenhardtia; a number of Nyctaginaceæ; the Dasylirion, and many others enumerated in this catalogue. The ligneous plants become shrubby and often thorny, and here the chaparals, so famous in northern Mexico, make their first appearance.

"Towards the northwest the granitic soil produces a number of plants, which indicate a connection with the flora of New Mexico, and again with that of our western plains.

"In the neighborhood of New Braunfels the effects of cultivation on the distribution of plants are already apparent. Helianthus lenticularis, Verbesina Virginica, Croton ellipticum, Nycterium lobatum, different Cenopodiaceæ and Amaranthaceæ are becoming very common in cultivated places; but others, Digitaria sanguinalis, for example, so common in eastern Texas, have not yet made their appearance. In Cedar woods Leria nutans, in damp bottom woods Dicliptera brachiata, on dry prairies the small blue Evolvulus, are getting much more abundant; while Pinaropappus roseus, Fedia stenocarpa and others are much rarer than they used to be in the first years of the settlement of the country.

"In the catalogue of the collections of 1843 and 1844,

mention is several times made of "deserted ant-hills." Further investigation has shown that these hills are formed by loose earth brought by these ants out of their subterranean excavations. These consist of oblique tubes, some eight or nine inches wide, others only half an inch in diameter; they sometimes reach a depth of thirty or forty feet. In the greatest depth are their granaries, containing often many bushels, and it is said, even wagon-loads, of corn and other grain. These ants are also common about New Braunfels, and this or another species has occasionally been found to be quite destructive to Mr. Lindheimer's collections."

G. ENGELMANN.

ERRATA.

Page 148, line 17 for "brevioribus" read breviore.
" " line 18, for "subæqualibus aut longioribus" read subæquali aut longiore.
" 153, line 3, for "piloso" read folioso.
" " line 18, for "stigma" read stigmata.
" 155, line 7 from bottom, for "glandular, hairy" read glandular-hairy.
" " line 11 " " for "axillæ" read axillas.
" 158, line 10 " " for "TEXANA" read TEXANUM.
" " lines 2 & 4 " for "foliis" read foliolis.
" 160, line 22, for "M. WRIGHTII" read MALVASTRUM WRIGHTII.
" 161, line 21, for "A. TEXENSE" read ABUTILON TEXENSE.
" 163, line 8 from bottom, for "pedicellas solitarias s. fasciculatas" read pedicellos solitarios s. fasciculatos.
" 174, line 10 from bottom, for "squamosis" read squarrosis.
" 177, line 6 " " for "tomento" read lomento.
" 179, line 13 " " for "24 - 30-juga" read 24 - 30-foliolata.

Art. II. — *Description of a new Species of Polypterus, from West Africa.* By W. O. Ayres. Boston, Mass.

The rivers of Africa, which had previously yielded two species of the remarkable genus *Polypterus*, have now afforded another. A specimen, brought by Mr. Perkins from Cape Palmas, and presented to the Boston Society of Natural History by him, is undoubtedly a representative of a new form. It is readily distinguished from the *bichir* and *senegalus* by the small number of dorsal fins. A specific name derived from its origin will not be inappropriate, more particularly as Cuvier has adopted the same course in regard to the one received by him from Senegal. It may be called *P. palmas.*

Its form is elongated, depressed at the head, nearly circular at the pectorals, and thence gradually becoming more and more compressed. The entire length is nine inches and three tenths; the greatest depth, about midway of the length, an inch; breadth at the same place, six tenths; breadth of the head, eight tenths. The specimen is quite manifestly full grown, or nearly so, and it is worthy of note that both the species discovered in West Africa are small while the one which inhabits the Nile is of much greater size.

One of the remarkable characters of the fishes constituting this genus is the strong lorication of nearly every portion of the surface. The plates which shield the head are granulated or shagreened. Those covering the upper portion of the head in this species are eight, arranged somewhat in pairs, though those of one side do not precisely match those of the other in position or size. The operculum is irregularly quadrangular, narrowest in front, arcuated posteriorly, nine twentieths of an inch in length. The pre-operculum, shorter and narrower than the operculum, is situated immediately in front of it. The inter-operculum, triangular in shape, is inserted between the two preceding pieces, with its base

descending as low as the base of the operculum. Two very small plates are below the anterior extremity of the pre-operculum. Between the opercular pieces and those which cover the top of the head is a narrow row, consisting of twelve small plates. This row commences immediately behind the eye, and extends to the back of the head; it is gently curved. The fifth and sixth plates in the row, counting backward, are free on their inner border, and form an opening to the back of the mouth, an arrange ent similar to that in the *Bichir*, which was conjectured by Geoffroy de St. Hilaire (Ann. de Mus. tom. i. p. 57.) to be a compensation for the imperfect mobility of the branchial plates. The inferior surface of the head consists of a single plate on each side, narrow in front, widest posteriorly; this plate undoubtedly represents the branchial rays of other fishes. The whole body is covered with hard, enamelled plates or scales which give it a tessellated appearance, as the exposed surface of each is rhomboidal. The portion by which they are inserted in the skin is prolonged into a tooth-like process, at the base of which another is sometimes seen, much smaller. The lateral line is straight, but is quite indistinct both at its origin and its termination.

The whole lateral surface of the head, anterior to the pre-operculum, and above the branchial plates is covered with smooth, soft skin. This by its projection in a fold beyond each jaw, forms a wide but thin and almost membranous lip. The lip is narrowest in front of the jaws, and its greatest width is on the side of the upper jaw, where it is two tenths of an inch. On all parts of the head, both the smooth and plated surface, are numerous uncommonly large and distinct holes for the admission of water.

About a fourth of an inch anterior to the eye is a barbule three tenths of an inch in length.

The operculum is provided beneath with a wide membranous border, which becomes narrower as it ascends, and does not extend to the upper portion.

The *teeth* are very numerous. The upper jaw has a single

row, which are separate, sharp-pointed, and nearly even. Behind these is a broad band *en velours*, extending backward beyond the angles of the mouth. The vomer expands at its anterior extremity into a circle which fills entirely the space between the bands already mentioned. This circular part, the remainder of the vomer, and the anterior portion of the sphenoid are also studded with thickly set teeth. The palatine bones and all the space between the maxillary bands and the sphenoid are furnished in the same manner. The whole upper surface of the mouth, therefore, is covered with teeth *en velours*. The lower jaw has a row of separate, sharp-pointed teeth, similar to those in the upper jaw. Behind these is a band of fine teeth, which however does not extend to the angle of the mouth. The tongue is broad, free, and smooth.

The *pectoral* fins arise beneath the posterior portion of the operculum. They are supported as in other species of the genus, upon an arm-like process or base. This is half an inch in height and is rounded on its posterior margin ; it is covered externally with minute plates similar to those of the body. These minute plates overlap the borders so as to appear on the edge of the inner surface, but the greater portion of this surface consists of smooth skin unarmed. The naked space thus left is bounded posteriorly by a curved row of very small plates or scales at the base of the pectoral rays. The plates are rounded at the base, with the summit somewhat truncated and armed with one to four slender, acute, uncinate spines or teeth. The surface of each plate is ridged like the shagreened plates of the head. Posterior to this row, on the membrane connecting the pectoral rays are placed many narrow scales which are furnished also with slender teeth. (Pl. 6, fig. 6.) These scales are not imbricate, each one being attached separately ; they do not extend over more than about half the height of the fin and half its length. They are not seen on the external surface, but in their place we find many enamelled ridges or tubercles not

on the connecting membrane but on the rays themselves, one to each joint.

The *free finlets* of the back are six in number. The first arises four inches and one fourth from the anterior extremity of the head. They are of nearly uniform size, from four to five tenths of an inch in height. The spinous ray which forms the anterior border of each is flattened transversely, slightly curved, bidentate at summit. The first two are provided each with two soft rays springing from the spinous ray, the third with three, the other three have each but one. The membrane of the first finlet does not extend to that which succeeds, and the same is true of the second and third; in the fourth and fifth it just reaches to the base, while in the sixth the membrane ascends slightly on the spinous ray of the seventh. The seventh is so attached to the caudal fin as to seem a portion of it, though its structure is precisely similar to that of the free finlets; it is provided with a single soft ray.

The *caudal* fin is slightly heterocircal. It contains sixteen stout and flattened rays, which present an enamelled surface similar to that of the plates covering the body.

The *anal* fin is composed of fourteen rays. The first nine are united into an apparently solid body without exhibiting the connecting membrane except near their extremities. This is readily effected from their peculiar shape. Each ray is a thin plate, placed transversely, having its sides curved backward, and the convex surface of each being closely applied to the concavity of the one preceding it, the membrane which joins them is seen only when they are forcibly separated. The last five rays are like those of ordinary fishes. The plates of the body at the base of this fin are free and extend a little way up its sides, forming a sort of sheath.

The *ventral* fins are placed upon a base similar to that of the pectorals, but much shorter. The rays are ten in number, resembling those of the caudal fin in structure.

As this specimen is the only one yet received, an examination of its internal structure is not within our reach; the abdominal viscera are all that will be mentioned.

The *stomach* passes directly backward from the œsophagus, at first enlarging and then tapering till it ends in a point beneath the first dorsal finlet. From the right side of the stomach, about an inch and a quarter from its termination, proceeds a branch which extends forward more than an inch, and then turning backward passes straight to the anus. A little posterior to the point where it thus turns, the intestine is suddenly enlarged and is provided with two pyloric cœca, one very short and the other about half an inch long.

The *liver* is elongated, rather small. It lies on the right side of the œsophagus and anterior portion of the stomach, terminating near the origin of the branch from the latter; its extremity is divided into two slender lobes.

The *spleen* is narrow, lying immediately above the intestine, from the last flexure to within about two inches of the anus.

The *ovaries* extend forward beyond the point of the cœcal portion of the stomach. In this specimen they are not enlarged, but in their advanced stages of development they must fill a large part of the abdominal cavity.

The specimen is not in such condition as to make the arrangement of the *air vessels* very apparent. One extends along the spine, the whole length of the cavity, and when inflated must occupy a large space. A second may exist, as in the *bichir*, but it is not seen in this specimen.

The *kidneys* are slender, extending the whole length of the abdomen.

As but two species of this genus have been hitherto indicated, very few words will be needed to show in what the present differs. The dorsal finlets present a character which is of itself conclusive. They are most numerous in the *bichir*, less so in the *senegalus*, and least of all in the *palmas*. But other points occur of equal importance, though we are com-

pelled to limit our comparison to the *bichir*, as no description of the *senegalus* has yet been published.

The arrangement of the *teeth* in the two species is quite different, the roof of the mouth being covered with them in the *palmas*, while in the *bichir* none are figured or mentioned on the vomer or sphenoid.

The *liver* of the *bichir* has two distinct lobes united anteriorly; that of the *palmas* appears single, but on close examination is seen to be slightly divided posteriorly.

The single *cœcum* is made by Valenciennes a generic character; this, however, will require revision, as the *palmas* shows two cœca with perfect distinctness.

It is worthy of remark, that while the number of known species of Ganoid fishes in America has been recently increased by the researches of Prof. Agassiz, we are enabled to add also to the small list of those which inhabit Africa. That this list is complete, we cannot of course believe, and we trust ere long to extend it further, having directed the attention of correspondents to this genus in both West and South Africa.

EXPLANATION OF THE FIGURES. PLATE VI.

Fig. 1. Side view.

Fig. 2. Outline, as seen from above.

Fig. 3. Inferior surface of the head, to show the branchial plates.

Fig. 4. Superior surface of the head. The row of small plates, on each side of the medial ones, descends so much upon the cheek that a portion of them in this aspect are not seen.

Fig. 5. Mouth opened, displaying the teeth of the vomer, palatines, &c.

Fig. 6. Inner surface of the pectoral fin.

Fig. 7. Scale from the lateral line. The hole with which it is pierced is not shown, as it is invisible by transmitted light.

Fig. 7. Abdominal organs, from beneath. *a*. Stomach. *b*. Liver. *c. c.* Ovaries. *d*. Pyloric cœcum. The dark space above the intestine and ovaries represents what remains of the air vessel. Its appearance during life we do not know.

Fig. 9. A portion of the abdominal organs in such a position as to display both pyloric cœca. The letters are the same as in Fig. 8, with the addition of *e* to denote the shorter cœcum.

The first two figures are slightly diminished, the seventh is enlarged, the others are of the natural size.

ART. XV. — *Observations on the Fishes of Nova Scotia and Labrador, with Descriptions of New Species.* By HORATIO ROBINSON STORER.

DURING the summer of 1849, I was enabled hastily to examine the waters of part of the coast of Nova Scotia, especially the so-called Gut of Canso, and of the southern coast of Labrador, which latter locality, at least so far as I can ascertain, appears never to have been visited by an ichthyologist. My sojourn on that coast was passed in the harbors between the Island of Anticosti on the south-west and the mouth of the Straits of Belle Isle, a region whose fishes seem what might have been expected from its situation, intermediate as it is between the comparatively warm waters of our own shores and the polar ice.

The object of this voyage was rather to gain additional knowledge concerning the limits to which the fish of our own waters range than to discover new species. But since I was fortunate enough to do both, I need make no apology for this paper, save for the lateness of the hour at which it appears.

1. ACANTHOCOTTUS LABRADORICUS Girard.

Plate VII. fig. 3.

Mr. Girard writes me thus: —

"When I wrote my Paper on the genus Cottus,[1] I had no expectation that so short a time would elapse before I could verify my opinion that there were more than one species confounded under the name of *A. grœnlandicus*. At your request I have compared one specimen of the so-called *A. grœnlandicus* from Labrador with the species of the same name from the shores of Massachusetts. The result is, that they are two distinct species.

[1] Proc. Bost. Soc. Nat. Hist. iii. p. 183.

"My prevision, however, did not go so far as to suppose that the species from Labrador should differ from that of Greenland, and I confess in that respect I am not yet fully satisfied, not having seen authentic Greenland specimens. Nevertheless, I think it would not be proper to refer the species from Labrador to the one of Greenland before a careful comparison can be made. The attention of naturalists will thus be directed to investigate how far I am right in separating from the Greenland Acanthocottus the species here referred to. At any rate it is different from *A. grœnlandicus* of the New England coast, and this last I will consider as a different species from *A. grœnlandicus* of Greenland, since we have an intermediate range occupied by another, the *Labradoricus*. I still believe that *C. variabilis* is a young fish and as I formerly proposed, this name can be applied now to the *A. grœnlandicus* of this coast, there being no necessity of creating a new name for it.

"We shall accordingly have the following synonymy:

ACANTHOCOTTUS GRŒNLANDICUS Grd. Proc. Bost. Soc. Nat. Hist. III. p. 185. — *Cottus Grœnlandicus* CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 185.— *Cottus scorpius* FABR. Faun. Grœnl. 1780, p. 156. Greenland; Oth. Fabricius.

ACANTHOCOTTUS LABRADORICUS Grd. The species here described. Labrador; Horatio R. Storer.

ACANTHOCOTTUS VARIABILIS Grd. — *Cottus variabilis* AYRES Proc. Bost. Soc. Nat. Hist. I. 1842, p. 68, and Bost. Jour. IV. 1843, p. 259 (Young). — *Cottus Grœnlandicus* RICH. Faun. Bor. Amer. III. 1836, p. 46, and Add. p. 297, Pl. 95, fig. 2. — STORER Rep. 1839, p. 16. — DE KAY, New York Fauna, 1842, p. 54, fig. 10. — Maine and Massachusetts; Dr. Storer. — Connecticut; W. O. Ayres. — Hellgate (N. Y.); De Kay.

"The *C. quadricornis*, Sabine, (App. to Parry's First Voy. 1821,) will belong either to the true *A. Grœnlandicus* or to

our *A. Labradoricus,* according to the shore of Davis's Strait, upon which it was found.

"Now, *A. Labradoricus* differs from *A. variabilis* in having one spine more on the inferior branch of the preoperculum, which spine is bent forwards, and at the same time is the smallest of that bone. The place where it occurs, its perfect symmetry on both sides of the head, leaves no doubt that it is not an accidental variation, like the one I have mentioned in a young *A. variabilis.*[1] Another difference consists in the presence of a double pair of spines above the orbits, the hind pair being the smallest. The occipital spines are proportionally nearer to each other than in *A. variabilis;* the frontal space they circumscribe being thus narrower behind. There exists all along the lateral line and above it, a row of hard plates, nearly circular, saucer-shaped, with the edge finely serrated. The largest, of a diameter of a line and a half, are near the head; they decrease in size in advancing towards the tail. A few are irregularly scattered on the space between the said row and the line of the back.

The formula of the fins is:

Br. 6. D. viii. 17. A. 14. C. 4. i. 5. 5. 1. 5. V. I. 3. P. 16.

"The pectorals and ventrals appear to be longer than in *A. variabilis.* The space between the posterior edge of the dorsal and anal and the caudal is greater.

"The state of preservation of the only specimen brought home did not allow any further description.

"The same law of uniformity which prevails in the history of the egg and during the development of the embryo is also observed among young animals, especially when they belong to closely allied species. We know even instances where the young of one species assumes the form of another genus. These facts will render difficult the attempt to refer to their true species young specimens, especially when several species occur in the same locality. Those collected

[1] Proc. Bost. Soc. Nat. Hist. III. p. 187.

by yourself plainly show this difficulty, and without a minute comparison with the adult fish it would be altogether impossible to give any opinion in regard to them. The characters are but feebly expressed. Sometimes the cephalic spines do not exist in specimens of several inches in length. *A. Labradoricus* is a more slender fish than *A. variabilis*, a character to be seen in the young. The head is smaller in appreciable proportions.

"The exact range of this species cannot yet be determined. I am inclined to believe that it will be found along the Labrador coast as far north as Baffin's Bay, and as far south as Newfoundland."

I first noticed it in Yankee Harbor among the St. Mary's Islands, off the south-west coast of Labrador, in such abundance that a barrel or more might be caught in a very few moments; thence we traced it as far eastward as Bras d'Or, where it appeared to have become of somewhat rarer occurrence. No specimens were seen in the Straits of Belle Isle.

2. Acanthocottus Virginianus Girard.

Among my smaller Labrador specimens are two, which Mr. Girard, who is certainly a most competent judge, pronounces to be the young *Virginianus*. I therefore insert this species upon his authority and that of Richardson, who speaks of having received a specimen from Newfoundland, although I neither saw the adult fish on the Labrador coast, nor that of Nova Scotia.

3. Acanthocottus patris H. R. Storer.

Plate VII. fig. 2.

Color. In the living fish the top of head and upper part of body are dark brown, marbled with greenish and crossed by transverse black bands. Abdomen pure white: which color extends up upon the sides in large blotches, with golden reflections. Orbit of eye and lower jaw with a row of

white spots. Throat ferruginous. Pupils black; irides golden. Lower margin of upper jaw white. Dorsals transparent, with oblique, dark brown bands. Pectorals yellowish, their upper two thirds banded with brown. Rays of ventrals and anal, cinnamon yellow; their membrane, transparent. Caudal rays, a light green. This specimen was taken in Great Mecatina Island Harbor. In another and larger specimen, taken at Red Bay, the head and upper part of body were of a dark brown throughout. Lower part of sides very sparsely marked with white. Abdomen white; lower portion of posterior part of body a dull flesh color. Lower portion only of orbit of eye variegated. Lower jaw marked with light brown blotches beneath. Throat tinged with yellowish.

Description. Head much flattened above. Spines thereof but slightly projecting outwards. Nasal spines but slightly recurved; post-orbitar two, the anterior much the larger; occipital well marked; four spines upon preoperculum, the posterior and superior much the larger, and with two, in one instance three, branches upon its inner portion; of the other three spines, which are comparatively quite small and blunt, the posterior is directed obliquely downwards and backwards, whilst the anterior points downwards and forwards. Spine upon operculum concealed by its marginal fleshy membrane so as at first to be scarcely perceptible; posterior-superior portion of operculum deeply emarginated. Humeral spines sharp and prominent. Irregularly scattered, sturgeon-like plates noticed on head of one specimen.

The lateral line commences just above and before the base of pectorals, and pursues a straight course to just above the termination of anal, where it curves slightly downwards and thence goes straight to the tail. A deep furrow, which greatly expands posteriorly, between eyes. Eyes large; nostrils tubular. Jaws armed with several rows of numerous small, sharp teeth; upper jaw the longer. Gape moderate.

Length of head not quite one third entire length. Great-

est width same as greatest depth and about equal to one fifth the length of fish.

The first dorsal fin arises on a line just posterior to extremityof thesuperior opercular spine; sub-triangular; somewhat rounded above and posteriorly; its height about half its length. The anterior spine, which is stoutest, projects least beyond the connecting membrane.

The second dorsal, which arises abruptly almost at the very termination of the first, is quadrangular; its height about one third its length.

Pectorals large, semi-triangular; their length two thirds their greatest height; superior rays nearly six times as long as inferior. They arise beneath the humeral spine, posterior to origin of first dorsal, and their base follows the curve of the branchial aperture nearly to abdomen. They extend, as do the ventrals, to beyond the commencement of the anal.

The ventrals, whose length is one fourth that of the fish, arise on a line half way between the humeral spine and origin of first dorsal, just below the termination of anterior third of base of pectorals. Tips of rays project beyond connecting membrane.

The anal commences on a line anterior to origin of second dorsal, and extends to just posterior to the termination of that fin. Its rays like those of the dorsals and pectorals are somewhat free at extremities.

The caudal is rounded posteriorly.

D. 11—15. P. 17. V. 3. A. 17. C. 12. Length 10 inches.

In the preopercular spines this species somewhat resembles the *A. pistilliger* of the north-west coast, from which, however, it differs in all other respects. It seems not an uncommon species on the Labrador coast, inhabiting chiefly the Straits of Belle Isle, in which it takes the place, as it were, of the *Grœnlandicus*. Caught in from ten to twenty fathoms water.

In the double capacity of naturalist and son do I dedicate

this, my first species, to Dr. D. Humphreys Storer. On the one hand, for his extensive contributions to American Ichthyology; on the other, in slight token of remembrance and gratitude for the very many pleasant hours we have spent together in the study of nature.

4. Acanthocottus ocellatus H. R. Storer.

Color. Ground color of upper part of body a light brown, thickly interspersed with darker spots. Sides as well as fins marked by large yellowish irregular blotches, with sometimes one of a much darker hue. Maxillaries, lower edge of operculum, throat, branchial rays and base of pectorals strongly sprinkled with fuliginous dots. Lower part of sides and abdomen a silvery flesh color, and marked as well as ventrals with white ocelli.

Description. Length of head about one fourth entire length; greatest depth equal to length of head. Spines upon head numerous and strong, and mostly free at their extremities. Nasal spines prominent, recurved. Post-orbitar spines hardly to be distinguished. Occipital spines, also, very small. Three spines upon preoperculum; that at posterior angle very stout, directed upward and backward, and extending about half the width of the operculum; below this, another nearly as stout directed downward and backward; and at inferior angle of preopercle, a third small and stout one directed downward and forward. Two spines upon opercle; the upper and larger arises at its anterior superior portion and extends directly backwards to its posterior angle; the lower and smaller points directly downward at inferior angle. Supra-scapular spine, as well as the scapular, of moderate size. A large depression upon head, back of eyes. Head abounding in mucous pores. Eyes large; diameter rather more than distance between them; pupils black, irides golden. Nostrils small, tubular. Jaws armed with numerous sharp, compact teeth. Gape of jaws large; upper jaw the longer.

Lateral line commences just above scapular spine, arches a

little backwards, and then pursues a nearly straight course to the extremity of the second dorsal, where it suddenly curves downwards, and then passes to the middle of the tail; a few small tubercles are upon each side of it.

The first dorsal fin is sub-triangular.

Second dorsal longer than high.

Pectorals large and rounded; extremities of all the rays free, except the few first.

First ray of ventrals strongly spinous.

Anal commences just back of origin of second dorsal, and terminates on a line with that fin.

The caudal fin is even at extremity.

D. 10—17. P. 16. V. 3. A. 14. C. 16. Length 6 to 10 inches.

This species was secured by hand net at Burial Island in Wilmot Harbor, Nova Scotia, the entrance to the Gut of Canso. It seems to resemble in its habits the fresh water Cotti, lying concealed beneath the rocks and sea weed, in several inches of water, and darting swiftly to another lurking place as soon as disturbed. My description was drawn from a living specimen.

5. Cryptacanthodes maculatus D. H. Storer.

A single specimen of this species, which has hitherto been noticed only in Massachusetts and Connecticut, was picked up on the beach at Burial Island, Nova Scotia. Length 2 feet 3 inches.

6. Gasterosteus Cuvieri Girard.

Plate VII. fig. 1.

Syn. *Gasterosteus biaculeatus*, Cuv. et Val. Hist. Nat. Poiss. IV. 1829, p. 503.

Knowing that my friend Girard was engaged upon a monograph of the North American Gasterostei, I placed in his hands specimens of what was evidently the *G. biaculeatus* of Cuv., requesting him to settle whatever question there might be concerning the validity of that species. He has done so,

and has given me the following account of his investigations and their results: —

"Those specimens are a very important acquisition for American ichthyology as far as the study of species is concerned, and I have been enabled to investigate more closely the history of what is recorded under the name of '*two spined Stickleback*' (G. biaculeatus.)

"John Reynold Forster published, in 1771, 'A Catalogue of the Animals of North America, &c.,' in which we find a *two spined Stickleback*, without any special indication of the locality whence it came.

"In 1792, Pennant, in his 'Arctic Zoölogy' also records a *two spined Stickleback* on the authority of Forster, and mentions New York as the place where specimens were obtained.

"In 1803 appeared, 'Shaw's General Zoölogy,' in which the *two spined Stickleback* is cited on the authority of Pennant, the author not having seen the species; yet he gives the systematic name of *biaculeatus*, which was not hitherto done.

"In 1815 Mitchill found the *two spined Stickleback* (G. biaculeatus) in the salt waters about New York, and gave a figure of it. There is no real description, and the figure, though perhaps good at that time, is very deficient to-day. The author says that this seems to be the species described by Shaw. But Shaw himself had not seen it and cites Pennant, who does not describe it, mentioning it indeed only on the authority of Forster.

"In 1829 was published the fourth volume of Cuvier and Valenciennes's 'Histoire Naturelle des Poissons,' where it is stated that a *two spined Stickleback* had been sent to Cuvier from Newfoundland. The description given in that work is very short, and insufficient to decide the species had we not specimens in our hands. Cuvier thought it to be the species figured by Mitchill, and probably, he says, 'the one mentioned under the same name by Pennant and Shaw.'

"In 1836 that fish reappears in Dr. Richardson's 'Fauna

Boreali Americana,' quoted from the above authorities; Sir John Richardson not having seen authentic specimens.

"Again, in 1842, a *two spined Stickleback* was described and figured by Dr. De Kay in the 'Fauna of New York,' published by that State; the author having found the fish 'about New York and as far up as Albany, in the Hudson, where the water is fresh.'

"This, then, is the whole history of the so called *two spined Stickleback*. And we find in it two well marked and very different eras; the first of which comprised the last century and the beginning of this, when the necessity of accurate description was not felt among naturalists, so that we thence see animals merely recorded in Catalogues, and often even under their vulgar names. They passed from one Catalogue into another without reëxamination, nay, much more, without even comparison. Such is the case with Forster, Pennant, and Shaw. There is no certainty, therefore, in documents of this class.

"The second era is characterized by the naturalists who belong entirely to this century. They began to describe with more or less accuracy, and their writings are accordingly much more precise than those of their predecessors. And yet it is still somewhat difficult to decide upon the identity of many animals on account of the descriptions not being comparative. Recent specimens from authentic localities can alone enable us to understand them. Since Zoölogy is comparative, we still meet with instances in all its branches where different species are described under the same name.

"Thus, after scrutinizing as far as it has been in my power the documents relating to the *two spined Stickleback*, I have come to the following conclusions: —

"1. That the presence of two spines in front of the dorsal fin is not a specific character.

"2. That the specimens brought by yourself from Labrador belong to the same species as Cuvier's *G. biaculeatus*, from Newfoundland.

"3. That the *G. biaculeatus* of Mitchill is another species, which may perhaps be the one referred to by Forster, Pennant, and Shaw, though we cannot now tell.

"4. And that De Kay's *G. biaculeatus* is not Mitchill's species, unless Mitchill had not the full grown fish, which may be the case, but which can be ascertained but by endeavoring to find it again and comparing it. For these ventrals, composed of a single but strong and serrated spine, that body entirely covered with bony plates, and that size of two inches and a half, make a fish of very different aspect from what we must infer from Mitchill's description. That it is not Cuvier's *biaculeatus*, De Kay himself remarked: "I cannot reconcile," he says, "the *Epinoche à deux épines* of Cuvier and Valenciennes with its naked tail and its robust, flat, and sharp tooth at the internal base of the ventral spines on each side, with our New York species." Mitchill speaks of his *G. biaculeatus* as being of very small size, and nowhere can we find any allusion made as to whether the body be naked or covered with plates.

"As for Cuvier's *biaculeatus,* we know that the tail is naked, whence the inference that the anterior part of the body is protected by plates, which is precisely the case with our Labrador species. Therefore I consider it the same fish, and as the name of *biaculeatus* must be retained for Mitchill's species, I shall describe it under the name of *Gasterosteus Cuvieri*, and in such a manner as will, I hope, enable naturalists to make minute comparisons with any other Stickleback having two spines in front of the dorsal fin.

"Total length of fish nearly two inches and a half, that is to say, of the size of the *G. biaculeatus* of De Kay, but very much more slender, although equally compressed, and a little larger than the specimens examined by Cuvier. The greatest depth of the body, taken perpendicularly to the second spinous ray of the back, is when compared with the total length as 1 to $5\frac{1}{2}$; the thickness in the same region is equal to half the depth. The posterior half of the body is naked.

A membranous carina existing on the sides of tail. There are four osseous plates posterior to the pectoral fins. The anterior one, which is situated a little in advance of the second spine, is the largest. In front of these and above the pectorals we observe the rudiments of three other plates, occupying the space between the first spine and the head. The surface of these plates is minutely granular, as well as the odd plates of the back and the bones of the skull itself. This granulation will undoubtedly be found different in different species.

"The head is one fourth of the entire length; it is flattened above. The lower jaw the longer. Teeth very acute and more prominent on the lower than the upper jaw. The eyes, which are proportionately large, are circular and near the upper region of the head; diameter of their orbit is to the length of head as 1 to $3\frac{1}{2}$; distance from extremity of snout exactly equal to their diameter. The nostrils are placed very high also, and a little nearer to the anterior margin of the eye than to the end of the snout; they open into a little depression above the first sub-orbital plate, the largest of the three, which is of a quadrangular form and covers all the space between the eye and the upper jaw; the granular striæ of its surface are also more marked. The second sub-orbital is much smaller, narrower, and in the shape of an elongated quadrangle. Finally, the third, irregularly rounded, sends a dilatation upon the horizontal branch of the preoperculum, leaving a naked space between the vertical branch of that bone and the posterior edge of the orbit.

"The *preoperculum* has a slightly obtuse angular shape; its margins are straight; the horizontal branch reaches the articulation of the lower jaw. The operculum is sub-triangular, with the external margin rounded. The inter-operculum, crescent-shaped, is a very small plate at the inferior angle of the operculum. The sub-operculum is elongated, very narrow, and slightly curved. The smooth space in front of the pectorals is large and sub-circular. The cubital bones strong

and stout, part from the isthmus and reach close to the ossa innominata; contiguous at their anterior extremity, they diverge a little posteriorly, so that a naked space is left between them under the thoracic region; their upper margin is concave and adjoining the smooth space in front of the pectorals. The ossa innominata form a strong abdominal cuirass; they terminate in a point at a short distance from the vent, sending an ascending branch which articulates with the plates of the sides. The vent is placed at an equal distance from the extremity of the caudal fin and the isthmus.

"The spines of the back are elongated and very acute, provided on both sides with slender spars or denticulations; the first one is inserted above the base of the pectorals; the second, a quarter of an inch posterior to this; the third, much smaller than the preceding one, is still more distant from the second, and is contiguous to the anterior margin of the dorsal fin. These three spines are furnished with a triangular membrane, running from the upper third of the spine to the dorsal line of the fish and forming a somewhat concave diagonal.

"The soft dorsal contains twelve rays; the second, third, fourth, fifth, and sixth of which are dichotomized. The anal has but eight rays, of which the second, third, fourth, and fifth are dichotomized; at the anterior margin of that fin we find a small spine with a short and thick base, terminated by an acute point and furnished with lateral spars. The posterior margin of the same fin does not extend beyond the posterior margin of the dorsal. The caudal is forked; it is composed of twelve well developed rays, all of which are bifurcated except the two external ones. Each lobe has, besides, five or six rudimentary rays hidden in the thickness of the skin. The ventral fins are composed of one strong spine and a soft and slender ray; this last is kept within the membrane inside of the spine for more than half its length. The spine itself is slender, a third of an inch in length; its base is widened and furnished along the upper edge with a flattened and sharp tooth; on both sides a minute serrature is to be seen,

even on the tooth itself. Bent close to the body, the ventrals do not quite reach the posterior extremity of the ossa innominata. The pectorals are nearly half an inch long; their extremity reaching beyond the cuirassed part of the sides of the body; they are composed of ten rays, which are undivided.

"The lateral line follows the curve of the back, to which it is nearer than to the belly.

D. II. 1.12. A. I. 8. C. 6. I. 5.5. I. 5. V. I. 1. P. 10.

"*Color* of specimen preserved in spirits as follows: a uniform grayish brown on head, back, and posterior half of body. Abdomen yellowish. Neck, operculum, and naked space in front of the pectorals, silvery, minutely dotted with brown. Fins transparent."

Seen both at Bras d'Or and Red Bay, Labrador, in the sandy mouths of every little rivulet. Somewhat sluggish in its habits.

7. Gast. biaculeatus Mitchill?

Quite plenty in the brooks emptying into the Gut of Canso, on the Nova Scotian side. It has elsewhere been noticed but in Massachusetts and New York.

8. Scomber vernalis Mitchill.

Although caught in such quantities in the Bay of Chaleur and among the Magdalen Islands, this fish seems rarely to visit the northern shores of the Gulf of St. Lawrence. The past summer, however, (i. e. 1849,) they were so abundant at the Island of Little Mecatina, that had fishing vessels been at hand, large fares could easily have been obtained. As it was, they were not molested; the few settlers there neither knowing their worth, nor having fit lines or nets for taking them. It seldom if ever ventures into the Straits of Belle Isle, although, according to Richardson, it is said to be at times taken on the southern Newfoundland shores.

9. Gunnellus mucronatus De Kay.

Taken with the *Acanthocottus ocellatus,* by hand net, in Wilmot Harbor, Nova Scotia. Hitherto observed only in Massachusetts and New York.

10. Gunnellus ingens H. R. Storer.

Plate VIII. fig. 1.

Blennius (Centronotus) gunnellus, Rich. F. B. A. III. p. 91.

This fish was considered by Richardson as identical with the English species. He had seen, however, but one specimen, and this, sent to Yarrell by Audubon from Labrador, had been nearly spoiled by long immersion in rum. Yarrell, also, from the same specimen considered the two fishes to be the same.

Color, olive brown marbled with darker, assuming a banded appearance after death. Base of dorsal fin marked by twelve to fifteen black spots, sometimes circled with white, which vary much both as regards size and situation, in some cases descending upon the sides more than the width of the fin. Pectorals lemon yellow. Color of anal varies greatly. A well defined brownish band descends from eye to below angle of jaw.

Description. Body elongated, much compressed; line of back ascending till it attains its maximum at a distance posterior to opercular angle about twice the length of the head. Head small, blunt; strongly depressed back of occiput; its length one ninth that of the body. Depth of body one fourth more than length of head. Cheeks protuberant. Gape of mouth moderate, obliquely upward, so that lower jaw, which otherwise projects, equals the upper when mouth is closed. Eyes large; their diameter a third more than the distance between them. A row of mucous pores on lower jaw, preoperculum, orbit of eye and nape. Teeth detached, disposed

in two or more rows anteriorly in both jaws, in a single row behind. The lateral line arises just above origin of pectorals, curves slightly with the body, and pursues a course nearly parallel to dorsal fin. Scales small and deeply imbedded.

The dorsal fin arises on a line with the posterior angle of operculum, and is connected with the tail by its membrane. Rays spinous, their ends projecting; the first three are the shortest.

Pectorals small, subovate.

Ventrals consist of a short, deeply imbedded spine, connected with a delicate and scarcely perceptible ray. They are nearly on a line with the pectorals.

The anal commences on the median line and is connected with the tail, but its posterior rays do not, like those of the dorsal, diminish in size. The first two rays are spinous; the others flexible and branched, their tips projecting. Equal in depth to the dorsal.

Caudal small and rounded.

D. 83. P. 13. V. I. 1. A. II. 42. C. 18. Length 7 to 12 inches.

This species, which is distinct from the *Grœnlandicus* of Reinhardt, is evidently more nearly allied to the *vulgaris* of Europe than to our little *mucronatus*. But it is a much deeper fish than the *vulgaris*, whose greatest depth is only equal to length of head; this difference I found in all of the many specimens I examined. Its teeth are arranged differently, those of the *vulgaris* being placed, according to Yarrell, in a single row in each jaw. Again, in that species the anal fin is deeper than the dorsal; it is not so in this. And finally it would seem that the different size should also be taken into consideration, specimens being rarely taken of the *vulgaris* which exceed six inches in length, whereas the Labrador fish of a foot is by no means uncommon. Nevertheless, I should hardly have ventured to dispute the opinion of the eminent British Ichthyologists, had not Mr. Girard, after careful examination, coincided in my views.

I found it in abundance along the whole southern coast of Labrador from St. Mary's Islands, at the extreme south-west, to the mouth of the Straits of Belle Isle. Though so much larger, its habits are the same as those of the *mucronatus*; lying oftentimes among the sea-weed at the surface in several feet water, and again concealing itself at the bottom under rocks.[1]

11. Zoarchus anguillaris Storer.

Observed hitherto to range from New York to Maine. At Bras d'Or it is frequently taken while seining herring, and is

[1] In comparing my specimens of *Gunnellus* from Labrador with those of Massachusetts, Mr. Girard has noticed among these last, one individual which indicates the existence on our coast of a species distinct from both *G. mucronatus* and *G. ingens*. He has favored me with the following description: —

Gunnellus macrocephalus Girard.

"The size is nearly that of *G. ingens* from Labrador, and consequently much greater than that of *G. mucronatus*. It differs from *G. ingens* in having a proportionally larger head, whence a larger mouth and larger teeth. These last are longer than those of *G. ingens*: their tip is club-shaped in both. They are arranged in two rows in front of the jaws; the principal row being the inside one on the lower jaw, and the outside one on the upper jaw. The head forms one eighth of the total length; its profile is very convex above the eyes, whereas in *G. ingens* the convexity of the head is in advance of the eyes, thus giving to it a more rounded appearance. The body of my species is more compressed than that of *G. ingens*; the height is also greater. The lateral line runs straight along the middle of the body. The vent, placed under the thirty-fifth dorsal ray, is at an equal distance from the snout and the tip of the caudal, whilst it is a little farther back in *G. ingens*, and rather nearer the head in *G. mucronatus*. The dorsal and anal are much higher than in both *G. ingens* and *mucronatus*. These fins are connected with the caudal by a membrane; although a notch is observed between them, deeper between the anal and caudal. The dorsal begins a little farther back in our species than in *G. ingens*. The pectorals are larger; their tip reaches beyond a line with the seventh dorsal spine.

"D. LXXVI. A. II. 41. C. 20. P. 12. V. I. 1.

"The rays of the anal fin show the remarkable peculiarity of having at their anterior and convex margin several small rays converging in an acute angle from the tip to the third or half of the length of the principal ray itself, in imitation, on a small scale, of the finlets of Scomber and Polypterus, with this difference, however, that in these last the additional small rays are on the posterior margin.

"In *G. ingens* these rays are dichotomized; in *G. mucronatus* they are simple.

"My specimen, the only one seen, was caught alive two years since at low tide on Chelsea Beach. It is preserved in Prof. Agassiz's cabinet."

confounded by the fishermen with the Lamprey. We caught a fine specimen by the hook, and observed many others cast up on the beaches.

12. Ctenolabrus cœruleus De Kay.

Cuvier received specimens from Newfoundland; Dr. Storer next mentioning it as in the waters of Maine, whence it ranges southerly as far as New York. It is so plentiful in the Gut of Canso, that by sinking a basket with a salt fish tied therein for bait, we continually caught them by the score; and by putting a few hundreds into the "well" of our little sloop, we kept ourselves, the dogs, and a hawk (*Falco Sancti Johannis*) well supplied with fresh fish whilst at sea.

13. Hydrargyra ornata Lesueur.

A species found, thus far, but from Delaware to Massachusetts. It is abundant along the shores of the Gut of Canso. I have since taken it also in Maine.

14. Salmo salar Lin.

Everywhere along the Labrador coast.

15. Salmo fontinalis Mitch.

This trout, the common species of the New England States, has not hitherto been noticed farther to the eastward than Maine. Richardson found it in Lake Huron, and, of late, Agassiz in Lake Superior. It is abundant in all the streams of the Southern Labrador coast, and often attains a large size. In the stomachs of several I found the bodies of full grown water mice. The cod fishers sometimes seine them at the brook mouths by hundreds.

16. Salmo immaculatus H. R. Storer.

Color. Silvery on sides and abdomen; darker on back. No spots.

Description. Length of head about one sixth length of body; depth of head two thirds its length; greatest depth of body, directly in front of dorsal fin, equal to length of head. Upper jaw the longer. Jaws with numerous sharp, incurved teeth. Eyes laterally elongated; their diameter one third the distance between them. Opercles rounded posteriorly; lower portion of operculum naked, marked with concentric striæ; preopercle larger than in the *fontinalis.*

Scales larger than those of the *fontinalis.* Lateral line commences back of superior angle of opercle, and, assuming the curve of the body, is lost at the commencement of the caudal rays.

The first dorsal fin commences just anterior to median line; is nearly quadrangular.

Adipose fin situated at a distance back of the first dorsal, little less than one half the length of the fish.

Pectorals just beneath posterior angle of operculum; their length three fifths that of the head.

Ventrals just beneath posterior portion of first dorsal; the plates at their base very large.

The anal is situated at a distance back of the ventrals just equal to length of head, and terminates directly beneath the adipose fin; of the form of first dorsal.

Caudal deeply forked; its length equal to greater depth of body.

D. 9. P. 13. V. 9. A. 11. C. 30. Length $13\frac{1}{2}$ inches.

But a single specimen of this beautiful fish was taken, and that by a gill net stretched across the mouth of a brook flowing into Red Bay, Labrador.

17. Mallotus villosus Cuv.

Has been noticed at Greenland by Fabricius, at Bathurst Inlet and Newfoundland by Richardson, and at Labrador by Audubon. The latter, in speaking of this favorite bait of the cod, does not exaggerate their numbers in the least. They

appear on the coast about the middle of July, and take their departure in the early part of August.

18. Clupea elongata Lesueur.

It seems somewhat surprising that the summer retreats of this fish have not hitherto been known to the naturalist, when we consider that cargoes upon cargoes of them are annually shipped from Labrador to the British Provinces, where they form so important an article of food. They have, thus far, been mentioned as found from New York to Massachusetts, and no farther.

In a Report to the Colonial Government on the Fisheries of the Gulf of St. Lawrence, made in March, 1849, and again in 1850, the Commissioner, Mr. Perley, confounds them with the European species, *harengus*, from which however they greatly differ.

We found them sparingly at Red Bay early in August, and a few days after in great abundance at Bras d'Or, farther to the westward, to which place vessels annually resort from Nova Scotia and the Magdalen Islands for the purpose of seining them. Arriving, as the herrings do, just after the Capelins retire, they form for the time the chief food of the Cod. The waste during the seining season is enormous, many more being taken than can possibly be cured, so that hundreds of barrels are left to rot upon the beach; and so fat are they that, for miles around, the water is completely covered by a thick oily scum, arising from the decaying fish. Much good oil is obtained from their entrails by exposing them to the sun in open casks.

19. Alosa cyanonoton Storer.

This fish has hitherto been noticed only at Provincetown, on Cape Cod. A single specimen was taken from a gill net in Red Bay, Labrador.

20. Morrhua Americana Storer.

Thus far, ranging from New York to Massachusetts. Is common in Wilmot Bay, Nova Scotia.

The different Labrador species of Cod, it will be impossible to ascertain with precision without a careful comparison with European specimens. Deformities are of common occurrence among them, usually consisting in a fore-shortening of the head, which gives them the name, among the fishermen, of "bull-dogs."

21. Phycis Americanus Storer.

Has, hitherto, been noticed only from New York to Massachusetts. We saw several large and fine specimens of this fish taken in the northern entrance to the Gut of Canso, as we were lying becalmed there on the twenty-ninth of August. It is a much larger species than the *P. punctatus*, described by Hamilton Smith, in Richardson, as taken off Halifax.

22. Hippoglossus vulgaris Cuv.

Fabricius mentions it in Greenland; and it has next been found on the banks off the Maine coast, whence it ranges to New York. Several specimens were taken at Red Bay, Labrador, during our stay; and I saw a fine one caught off Halifax, Nova Scotia, as we passed within hail of a fishing-smack at anchor there.

23. Platessa plana Storer.

Has, hitherto, been taken from New York to Massachusetts; I have lately seen it also in Maine. It is probably the most common flounder on the south-west Labrador coast. We met with it first, though but sparingly, at the St. Mary's Islands, and observed it as far easterly as Bras d'Or; where it is to be found in immense numbers, the bottom being almost alive with them, and of large size. It appears to be confined to harbors and inlets sheltered from the fury of the sea; as

to the nature of the bottom, it is indifferent, frequenting alike sandy and rocky situations, where it has for its neighbors only the *Acanth. Grœnlandicus* and lobsters, of which latter an abundance is to be found as far to the eastward as Bras d'Or.

24. Platessa rostrata H. R. Storer.

Plate VIII. fig. 2.

Color. Bluish slate, with yellowish spots. Outer ray of caudal both above and below, white; as is also the posterior ray of both dorsal and anal.

Description. Eyes on right side of head. Form elliptical. Length of head about one fifth length of fish. Greatest depth one half whole length. A prominent ridge between eyes, which curves upward and backward, continuing to posterior margin of operculum. Snout much projecting, so as to form a deep hollow at the anterior superior angle of upper eye orbit; just behind this hollow and over anterior half of eye, the back begins to ascend. Gape of mouth moderate. Jaws equal and fully armed with numerous minute teeth; teeth also on hyoid bone. Eyes moderate; a semicircular line, much resembling in appearance the lateral line, below lower eye, thus partly encircling it.

The lateral line, which seems to be a continuation of the ridge on operculum, curves abruptly and much over pectorals, and then pursues a straight course to middle of caudal fin. The curve here spoken of is, as well as that of the opercular ridge, much less on left side than on right; and the line itself is not so plainly perceived.

Operculum somewhat emarginated just front of pectorals. Anal spine prominent; blunt spine on chin perceptible; also that at inferior angle of preopercle. Scales on left side much more firmly imbedded than on the right. A small patch of scales on the superior portion of operculum, together with those in the immediate neighborhood of the lateral line, much the largest.

The dorsal fin arises somewhat abruptly, and attains its greatest height on a line posterior to the middle point.

Pectorals fan-shaped; the left the smaller.

Ventrals moderate, their extremities just reaching the anal fin.

Anal commences about on a line with the middle of the right pectoral. Its anterior rays as well as those of the dorsal present the appearance of being scaled; the posterior rays, on the contrary, much more delicate.

The caudal is rounded when expanded, the outer rays being the shortest.

D. 75. P. 13. V. 6. A. 56. C. 16. Length about 7 inches.

With the exception of one specimen at Red Bay, this species was met with only at Bras d'Or, where it is very abundant, inhabiting however a far different region from the *plana*, just mentioned. Instead of sheltered bays and harbors, it delights in the surf of the open beaches exposed to the waves of the whole Gulf, and is here taken in great numbers at the drawing in of the herring seines.

25. Lumpus Anglorum Will.

Mentioned by Fabricius among the fishes of Greenland; ranges from New York to Maine. Found it plenty at Bras d'Or, and sparingly at Red Bay, where I captured a large specimen with my hand, as it adhered to a rock. We also caught small specimens in abundance, that I am inclined to think must belong to this species, with the hand-net, adhering to masses of sea-weed off Nova Scotia.

26. Anguilla Bostoniensis De Kay.

Of this species, which has hitherto ranged from New York to Massachusetts, I observed a fine specimen lying in a wigwam on the western shore of the Gut of Canso. In a little

nook near by, called Pirate's Cove, we subsequently observed several others speared by the Indians by torchlight.

27. Ammodytes Americanus De Kay.

Has ranged from New York to Massachusetts. Richardson quotes from Fabricius a description of a species found in Greenland and, as he thinks, also in Labrador, which, without having seen a specimen, he decides to be the same as the European *A. lancea.*

After a careful comparison, however, of the Labrador fish with specimens from Cape Cod, and with another from Newfoundland, presented me some time since by Dr. Wheatland of Salem, I am compelled to consider them all the *Americanus.* The Labrador fish may be perhaps a little plumper, but there are not sufficient characteristics to warrant a distinct species. It certainly is not the *lancea.*

We found it abundant at Red Bay, where, like the Capelin and Herring, it is used as bait in the Cod fishery.

28. Acanthias Americanus Storer.

Has been noticed from New York to Massachusetts. I have seen it in Maine, and Dr. De Kay states also that it has been taken to the north, beyond the coast of Labrador.

We found it early in August at Bras d'Or and Red Bay, and subsequently saw large numbers taken off Shelburne at the south-west extremity of Nova Scotia.

29. Scymnus brevipinna De Kay.

A jaw of this shark was obtained at Bras d'Or, where it had been taken, and I am inclined to think that it is by no means uncommon upon the Labrador coast.

ART. XV.—*Descriptions and Figures of the Araneides of the United States.* By NICHOLAS MARCELLUS HENTZ, Tuscaloosa, Alabama.

[Concluded from page 35.]

Genus THERIDION Walckenaer.

Characters. *Cheliceres small, cylindrical; maxillæ widest at base, pointed towards the tip, inclined over the lip; lip small, very short, widest at base, subtriangular; eyes eight, equal, four in the middle, nearly forming a parallelogram, two on each side, placed diagonally; feet slender, the first pair longest, the fourth and the second nearly equal, the third being the shortest.*

Habits. Araneïdes sedentary, forming a web made of threads crossed in all directions. Cocoon of various shapes.

Remarks. The subgenus THERIDION contains many species, a majority of which are very small, and whose webs, made on the tops of weeds, in bushes, or in retired corners, are familiar to every one.

I could not adopt any one of the families or tribes of Walckenaer, and it is indeed a difficult matter to subdivide this subgenus. Whether I have succeeded better will be decided by naturalists.

Tribe I. GEMINATÆ. *External eyes approximated. Spiders usually small.*

1. THERIDION VULGARE.

Plate IX. Fig. 1.

Description. FEMALE. Varying from a cream white to a livid brown, or plumbeous color; cephalothorax dull rufous, abdomen with various undulated lines; feet with more or less distinct, dark or plumbeous rings, 1. 4. 2. 3.

MALE. Slender, same colors and markings except the legs, which are usually rufous, longer, and have their respective length, thus, 1. 2. 4. 3.

Observations. This constant and common inhabitant of any dwelling where the broom is not much in use, is very readily recognized notwithstanding the variations of its colors. There is, probably, no spider so abundant in the United States, or so well known to the observer of nature. It makes an irregular web in somewhat retired corners, and usually in dark situations, but occasionally also in the open air. The thread of this web is not very strong, but, by its skill and its activity, the spider makes up for the deficiency. The moment it feels by the vibrations that an insect is caught, it proceeds to the spot with caution, if the prisoner is a large one, and with its posterior legs it throws additional threads, with which it binds the victim with surprising rapidity. As soon as the insect is securely bound, it grasps the end of one of its legs with the fangs of its cheliceres, with which it inflicts a wound which stupefies it in a few seconds. If the prey be not too heavy, it lifts it up to the upper part of its web, where it abides; but when the insect is a very large one, it continually throws more threads around it, and from time to time ascends to the top with additional ligatures which it firmly fixes to the main threads, and which it pulls as tight as possible. These, by their elasticity, gradually tend to lift up the insect, which by its struggles catches and entangles the threads around its limbs, and in course of time it is hoisted to the top, though the process sometimes continues two and even three days. I have seen an ATEUCHUS (*Coprobius*) *volvens* thus lifted up by a little *Theridion vulgare.* In this case the captured victim probably weighed eighty or a hundred times as much as its destroyer. I have also seen large silk-worms hung up by spiders of this species. In that case the weight raised was still greater. Its cocoon is placed also at the top of the web. It is of a brownish color, and made of somewhat loose threads. The eggs are not glued

together, and hatch early. Many cocoons are frequently seen on the same web, though usually there is but one at a time with eggs, the others being previously vacated. This proves the immense propagation of this common tenant of our houses.

This spider differs from some other species in its never concealing its home in holes or crevices.

Habitat. All the United States.

2. THERIDION SERPENTINUM.

Plate IX. Fig. 2.

Description. Rufous; abdomen yellowish glossy, with two winding lines, connected with the sides, black; varied with black underneath; feet 1. 4. 2. 3.

Observations. This spider was brought to me from Georgia by Mr. Thomas R. Dutton. A specimen very much resembling this was found in Alabama, but the trophi were those of *Theridion studiosum*, which is not as large a species as this.

Habitat. Georgia.

3. THERIDION MARMORATUM.

Plate IX. Fig. 3.

Description. Rufous; abdomen with two impressed dots, whitish, varied with spots and veins black, base whitish, piceous underneath with a few obsolete pale dots; feet 1. 4. 2. 3.

Observations. This spider, though closely related to *T. boreale* and *T. serpentinum*, departs from the characters of this subgenus by its trophi, which are those of Epeïra, by a strange anomaly. It is not uncommon under stones. The mouth was examined several times and always presented the character of Epeïra. It was always found under stones.

Habitat. Alabama. March, June.

4. THERIDION BOREALE.

Plate IX. Fig. 4.

Description. Piceous; abdomen with a whitish band anteriorly, connected with a longitudinal paler one, and with four impressed dots, two more visible than the others. Palpi of the male enormous, as in the plate; feet 1. 4. 2. 3.

Observations. This spider makes its web in darker places than *Th. vulgare*, near a crack or crevice, in which it commonly remains concealed. It also makes its web in the crevices of decaying trees. It is not rare.

Habitat. The United States.

5. THERIDION STUDIOSUM.

Plate IX. Fig. 5.

Description. Greenish brown; abdomen above with two scalloped yellowish lines, beneath with some yellow spots; feet with greenish rings; feet $1. \widetilde{4. 2.} 3.$

Observations. This spider makes its web on bushes like *Linyphia*, frequently on a bush of dead leaves; it is horizontal and closely woven like that of *Agelena*, and is surmounted by threads crossed in every direction, but there are none underneath. This species has great affinity to *Linyphia*. It does not remain in an inverted position under the horizontal web, but abides in the middle like other species of *Theridion*, and, in the same manner as some species of *Epeira*, it brings together a few leaves as a shelter. When its web is destroyed, it does not abandon its cocoon, which is orbicular and whitish, and is placed in the central part of the web. The mother then grasps it with her chelicceres, and defends her progeny while life endures. She also takes care of her young, making a tent like that of social caterpillars for their shelter, and remaining near them till they can protect themselves. This spider is very sedentary and little inclined to move; always of small stature.

Habitat. South Carolina, Alabama.

6. THERIDION ANGLICANUM.

Plate IX. Fig. 6.

Description. Body, basal joints of palpi, and base of the thighs, red rufous; abdomen without projection or spot; legs 1. 2. 4. 3.

Observations. An individual, supposed to be the male of this, was found in September, with the legs 4. 2. $\widetilde{1.\,3}$., and the abdomen black; palpi very large and complicated.

Habitat. Alabama, in June.

7. THERIDION FRONDEUM.

Plate IX. Fig. 7.

Bluish white or pale; cephalothorax with a longitudinal black line; abdomen with six small spots, black, united with a central brownish line; pale yellowish beneath; feet with a few black rings, first pair very long, 1. 4. 2. 3.

Observations. This distinct species occurred only once, and was found on a weed.

Habitat. Alabama. July.

8. THERIDION CRUCIATUM.

Plate IX. Fig. 8.

Description. Pale; abdomen obscure piceous, with a scalloped band, whitish; feet with blackish rings except the third pair. A very small species; feet

Observations. This spider was found in its web, made like that of other species of the subgenus *Theridion.*

Habitat. Alabama. September — October.

9. THERIDION OSCITABUNDUM.

Plate IX. Fig. 9.

Description. Abdomen yellowish testaceous, with a subobsolete, rufous, abbreviated line; cephalothorax rufous, region of the eyes black; feet 1. $\widetilde{2.\,4}$. 3.

Habitat. Found in the hollow of a dry leaf; Alabama.

10. THERIDION SUBLATUM.

Plate IX. Fig. 10.

Description. Pale; cephalothorax piceous, pale on the disk; abdomen with piceous markings, sometimes wholly brown above; pale underneath, with a dusky band; feet always pale, 1. 2. 4. 3. A minute species.

Observations. This little spider makes its web in the tops of weeds, in the same manner as *Th. morologum.* It is a common species.

Habitat. Alabama. May.

11. THERIDION FUNEBRE.

Plate IX. Fig. 11.

Description. Black; palpi yellow; abdomen with two bent bands at base, and a V spot at the apex yellow; feet yellow, thighs tipped with black, the other joints with rings, and tipped with black, 4. 1. 2. 3. A small species.

Observations. This species is very distinct from any other. It was found wandering.

Habitat. Alabama. October.

12. THERIDION LEONINUM.

Plate IX. Fig. 12.

Description. Yellow; cephalothorax varied with black spots and lines; abdomen with two small tubercles anteriorly, blackish towards the base, with two spots and an inverted T band, blackish; feet hairy, particularly the two anterior pair, varied with black rings, 1. $\widetilde{2.\,4}$. 3. A small species.

Observations. This singular little spider makes its web, like other species of Theridion, in dark corners and recesses. The markings on the abdomen make a tolerable resemblance to the face of a lion.

Habitat. Alabama. March.

13. THERIDION MOROLOGUM.

Plate IX. Fig. 13.

Description. Brownish rufous; cephalothorax with some longitudinal hairs; abdomen with two oblique lines near the base, one near the centre, and one near the apex, all abbreviated; feet 1. 2. 4. 3.

Observations. This may prove to be the male of *Th. foliaceum*, but it does not seem probable to me. It was repeatedly found near the ground, making its web on blades of grass. Only males were found, which renders it probable that the female differs in markings.

Habitat. Alabama. October 13th. After frost.

14. THERIDION FOLIACEUM.

Plate IX. Fig. 14.

Pale brownish; cephalothorax rufous; abdomen with about four oblique curved bands on each side; feet pale yellowish, 1. 2. 4. 3. A small species.

Observations. This species is usually found making a slender web in the hollow of leaves.

Habitat. Alabama. October.

15. THERIDION ROSCIDUM.

Plate IX. Figs. 15, 16.

Description. Cephalothorax rufous; abdomen testaceous, with shades of light blue and purple, with four impressed dots and some smaller impressions; testaceous, unspotted underneath; feet pale rufous, 1. 2. 4. 3. Male rufous, with large cheliceres; abdomen piceous, with several rufous spots on a central line. A very small species.

Observations. This species makes its web usually in the hollow of large leaves, where the male and female are often found together. The male is usually of a deeper color, and the female is sometimes deeper than represented in the plate.

Its cocoon is somewhat oval, not very regular in shape, of a snow-white color.

Habitat. Alabama. April.

16. THERIDION CANCELLATUM.

Plate IX. Fig. 17.

Description. Abdomen ferruginous, with four transverse white bars; thorax fuscous; legs ferruginous, articulated with dusky; legs 1. 2. 4. 3.

Observations. Found in a cavity in limestone rock, male and female in the same web, made on the roof of the cavity, the spiders being in an inverted position.

Habitat. Alabama. April.

17. THERIDION INTENTUM.

Plate IX. Fig. 19.

Description. Abdomen yellowish, venter reddish brown, with three transverse orange bands posteriorly, sides black and also the median line of the back; thorax and legs black; legs 1. 2. 4. 3.

Observations. A male and a female were found in the usual web on a bush in a sink-hole on the La Grange Mountain. The male resembled the female in markings.

Habitat. Alabama. August and September.

18. THERIDION BLANDUM.

Plate IX. Fig. 20.

Description. Cephalothorax rufous, deeper in a line from the eyes towards the base; abdomen purplish, with an oblong scalloped yellowish spot; feet pale yellowish green, $1.\ \widetilde{2.\ 4}.\ 3.$ first pair very much longer. A small species.

Observation. This spider makes its web in dark corners. Its cocoon is rounded and white. It is closely related to *T. Lyra.*

Habitat. Alabama. September.

19. THERIDION LYRA.

Plate IX. Fig. 21.

Description. Pale; cephalothorax with a slender black line branching out towards the eyes; abdomen with two basal curved, black lines, and a central branching dusky line, more or less distinct; pale, spotless beneath; feet $1.\widetilde{4.2}.3.$ first pair much the longest. A small species.

Observations. This makes a web like *Th. blandum.*

Habitat. Alabama. September.

20. THERIDION SPHÆRULA.

Plate IX. Fig. 22.

Description. Yellow; cephalothorax with a black band, or wholly black; abdomen subtriangular, orange, with a yellow spot on the disk; one spot at each external angle, and region of the nipples black; sometimes it is black or deep rufous above and beneath, except the yellow spot on the disk, and two little yellow dots near the base; feet pale yellow, $1.\widetilde{2.4}.3.$ A very small species.

Observations. This very variable species is nevertheless readily recognized by the shape of its abdomen. It is common, and makes an orbicular white cocoon placed in its web.

Habitat. Alabama. May — September.

21. THERIDION GLOBOSUM.

Plate IX. Fig. 23.

Description. Black; abdomen truncated behind, truncated area whitish with an obscure spot, and obsolete marks; feet 1. 4. 2. 3. A very small species.

Observations. This very distinct little Theridion was found in its web on the stump of a tree. Its cocoons, quite numerous, were of a pale cream color, tapering at both ends equally. Young spiders were issuing from one of them. Specimens, evidently of the same species, were found in June,

which were yellowish where this is black; otherwise agreeing with this in form and marking.

Habitat. Alabama. August.

Tribe II. PARTITÆ. *External eyes far apart.*

22. THERIDION TRIGONUM.

Plate IX. Figs. 24, 25.

Description. Pale brown or yellowish; lower middle eyes borne on tubercles; abdomen triangular with changeable rufous lines, chiefly on the sides; male rufous, abdomen triangular, narrower behind; feet $1.\widetilde{4.2}.3.$ or $1.\widetilde{2.4}.3.$ A small species.

Observations. This species, though varying much in color and marking, is at once recognized by the form of its abdomen, which, when viewed sideways, appears three-sided. It makes the usual web of Theridion, but sometimes it has an additional web like that of Linyphia. It is found, very common in autumn, constantly in an inverted position in the middle of its web. Its cocoon is of a very singular shape, being orbicular and sometimes ovoid, with a neck turned downward, like an inverted gourd, and suspended by a thread attached to the web. One of those cocoons being opened was found to contain the pupa of an hymenopterous insect, a parasite.

Habitat. Alabama. July — September.

23. THERIDION VERECUNDUM.

Plate X. Figs. 1, 2.

Description. Deep black, glossy; abdomen with blood-red spots underneath which sometimes extend above in a chain, and with some waving white lines anteriorly, which are sometimes wanting; feet 1. 4. 2. 3. Male slender, abdomen with orange and white spots.

Observations. This spider, by its jet black color, is readily

distinguished. It is very common under stones, logs, or clods of earth, where it makes a web, the threads of which are so powerful as to arrest the largest hymenopterous insects, such as humble-bees. Its bite, if I can rely on the vague description of physicians unacquainted with entomology, is somewhat dangerous, producing alarming nervous disorders, which, however, are readily dispelled by brandy and other stimulants. There is no doubt that all spiders have a poison conveyed in the fang of their cheliceres, but in this case these organs are very small in proportion to the size of the spider, and, it would seem, are barely long enough to penetrate through the epidermis of a man's hand or foot.[1] The male, whose palpi have the black coil or penis external and very easily observed, is distinguished from the male of *Theridion lineatum* by that character, by its longer and slender legs, and by the white spots on the sides of the abdomen, which are not elongated in the form of lines. It has always been found on the top of weeds in a small web, and never under stones near the female. The cocoon is yellowish cinereous, of an ovoid form, and suspended by its pointed extremity.

Habitat. North and South Carolina, Georgia, Alabama, &c.

24. THERIDION LINEATUM.

Plate X. Fig. 3.

Description. Cephalothorax blackish; abdomen deep purple, or reddish black, with several diagonal white lines, and a succession of red spots edged with yellow, and sometimes united in the form of a band; a red spot underneath also; feet blackish, usually varied with yellow, 1. 4. 2. 3. Male with the same markings.

Observations. This very common species is usually found under stones, logs, or clods, always near the ground. It serves as a prey to those singular hymenopterous insects, usually called in the South, *dirt daubers,* which enclose in

[1] See Règne Animal, IV. 243, A. mactans.

their clay nests from twenty to forty small spiders, to serve as food for their progeny. I once counted thirty-eight specimens of this species extracted from one cell, made by a *Trypoxylon*, and I have found them repeatedly in the nests of *Sphex cyanea*. There may be some difficulty in distinguishing the male of this species from the male of *Theridion verecundum*; the differences are pointed out in the description of that species. The male of this has never been observed with a compound palpus; the last joint was merely greatly enlarged as in the plate; but in some specimens the enlargement was less remarkable. Can it be that none of the very many specimens observed by me were not yet adult, and that the compound parts of the male organ appear only at a certain period? It is possible that the plate representing the male of this must be referred to *Th. verecundum*.

Habitat. North Carolina, Alabama.

Tribe III. VENTRICOSÆ. *Abdomen caudate, subtriangular.*

25. THERIDION ? FICTILIUM.

Plate X. Fig. 4.

Description. Pale silvery on the abdomen above, yellowish underneath, with an abbreviated blackish band from the nipple-like projection, tapering towards the apex. Legs long and excessively slender; 1. 4. 2. 3.

Observations. This spider makes a web like *Theridion*, and remains motionless in an inverted position. The projection of the abdomen is capable of bending over nearly double. The markings of the male and female are alike. It is closely related to *T. intentum*.

Habitat. Alabama. July — September.

26. THERIDION ? PULLULUM.

Plate X. Fig. 5.

Description. Animal yellow, with a longitudinal, forked, median brown line on the thorax; sides and the central line

of the back dark brown, and on each side of the latter four ocellated brown dots; legs long and slender, 1. 4. 2. 3.

Observations. This little spider makes a thin looking web, somewhat like *Theridion,* and dwells in dark places, in folds of paper, old rags, &c.

Habitat. Alabama.

27. THERIDION? PERTENUE.

Plate X. Fig. 6.

Description. Very small, cephalothorax, abdomen, and palpi black; feet rufous, 4. 1. 2. 4.

Observations. Found usually under stones.

Habitat. Alabama.

Genus SPINTHARUS mihi.

Characters. *Cheliceres very slender; maxillæ slightly inclined towards the lip, widest at base, obliquely truncated above; lip short, wider at base, slightly emarginate; eyes eight, equal, disposed in the form of an ellipse open towards the base, two external eyes touching; feet long, slender, fourth pair longer than the first, the third being the shortest.*

Habits. Araneides sedentary, probably making an irregular web composed of threads crossed in all directions, suspending themselves from a single thread, and thus capturing insects. Cocoon unknown.

Remarks. The species which serves as the type of this new subgenus could not be referred to THERIDION. This will be obvious, when it is observed, that its characters all depart from those of that natural subdivision, particularly its maxilla which approach the form of that organ in EPEIRA; by the position of its eyes, and the respective length of its feet, this spider would seem to approach wandering araneides. It may ultimately be located among these.

SPINTHARUS FLAVIDUS.

Plate X. Fig. 8.

Description. Yellowish; abdomen orange yellow, edge white, disk with a yellow margin, and spots surrounded and crossed in two places by a scarlet line, orange yellow, spotless beneath; feet, first and fourth pair with the antepenult joint tipped with orange, $\widetilde{4.1}.2.3$.

Observations. This spider was found hanging by a thread from a tree thirty or forty feet high. It had secured, while thus suspended in the air, a wasp, (*Vespa*) which, though many times larger than itself, was safely bound up for a repast.

Habitat. Alabama. September — October.

Genus Pholcus Walck.

Characters. *Cheliceres small, cylindrical; maxillæ long, tapering to a point, inclined over the lip; lip widest near the base, short; eyes eight, subequal, two in the middle in a transverse row, three on each side placed together in the form of a triangle; feet excessively long, first pair longest, then the second, the third being the shortest.*

Habits. Araneïdes sedentary, making in dark corners a very loose web of slender threads, crossed in all directions. Eggs collected together without a silk covering, which the mother carries with her cheliceres.

Remarks. This subgenus, by the extreme length of its legs resembles Phalangium. The species belonging to it may be found in apartments seldom visited, particularly churches or caves. They shake their body, when threatened by an enemy; but seem to have very weak means of offence, and to feed on the very smallest prey.

PHOLCUS ATLANTICUS.

Plate X. Fig. 7.

Description. Pale or livid yellow; abdomen with more or less distinct lines and spots; cheliceres articulated together

near the middle; sometimes attaining four inches from the end of the anterior to that of the posterior leg.

Observations. This apparently powerless spider, no doubt related to the *Aranea phalangioides* of Europe, is found in the dark corners of the ceilings of uninhabited houses, in loose webs scarcely strong enough to detain any, even small insects. It is inactive, and never was seen by me with any prey, or with the show of obtaining any. This ought not to be mistaken for the *Phalangium* which children call daddy-long-legs. The female carries her eggs glued together, without a cocoon, in her cheliceres.

Habitat. Southern States. Alabama, at the entrance of limestone caves.

A female was found in Alabama in June, with a body resembling an orbicular cocoon, which she carried in her cheliceres. On tearing the silk covering, it was found to contain a Clubiona, which was thus wrapped up for future meals.

Subgenus Oophora mihi.

[Silliman's Journal, Vol. xli. p. 116.]

Characters. *Cheliceres short, cylindrical; maxillæ wide at base, tapering to a point, inclined over the lip; lip short, widest at base; eyes six, equal, three on each side, placed together in the form of a triangle; feet slender, moderately long, first pair longest, the fourth and the second nearly equal, the third shortest.*

Habits. Araneïdes sedentary, making in obscure places an excessively loose and slender web, composed of a few threads crossed in various directions. Eggs not enclosed in a cocoon, but agglutinated together, which the mother carries between her cheliceres.

Remarks. This subgenus is very closely related to Pholcus. Nay, had it eight eyes instead of six, and were its legs much longer, it could not have been separated from that sub-

division of ARANEA. But it is obvious that these characters require the separation.

The spider upon which the subgenus is constituted has habits similar to those of PHOLCUS. It does not dwell in walls, but seeks dark nooks under any kind of rubbish which has been long neglected, and, when disturbed, runs off with its progeny, if it have any, and seeks for some darker place undisturbed by the broom of the housewife. It must live on microscopic animalcules, owing to its diminutive size, and the weakness of its threads.

OOPHORA MERIDIONALIS.

[Silliman's Journal, Vol. xli. p. 116.]

Plate X. Fig. 9.

Description. Livid white or pale yellow above and beneath; cephalothorax with two small, angular, plumbeous spots.

Observations. This small spider is common in dark corners and obscure apartments, where it makes loose, slender webs in the manner of *Pholcus*. The female is always found with her eggs, when she has them, carrying them in her cheliceres. These eggs are not enclosed in a cocoon, but glued together in a mass consisting of from ten to fifteen.

Habitat. North Alabama.

MYGALE FLUVIATILIS.

Plate X. Fig. 15.

Description. Livid; cephalothorax with a depression near the middle above; abdomen with two transverse lines near the base; third pair of legs sensibly larger, though shorter than the rest. Feet 4. 1. 2. 3.

Observations. This new species was found in the water during an inundation of the Tennessee River. It has been found since in its hole, deep in the ground. The tubular cavity, at least a foot in depth, was supplied with a *door* or silken lid, closing the aperture.

Habitat. Alabama. March, October.

Subgenus Katadysas mihi.

Characters. *Eyes eight, subequal, in two rows, both curved downwards ; fang of the cheliceres articulated downwards ; palpi inserted near the extremity of the maxillæ. Feet* 4. 1. 2. 3. *Pulmonary orifices only two.*

Observations. This very anomalous spider, found only once, offers a very striking instance of the manner in which nature combines characters, so as to separate widely, animals which are apparently closely allied. This has all the essential characters of Mygale, but one, (having but two pulmonary orifices) and yet it is obviously related to Lycosa, near which it should be placed in a natural arrangement. I know nothing of its habits, except that it dwells or hides under stones. It probably makes no web.

Habitat. Alabama.

KATADYSAS PUMILUS.

Plate X. Fig. 16.

Description. Livid, testaceous; cephalothorax with two longitudinal bands near the middle, and two curved fillets near the edge, fuscous; abdomen with a line bifurcated anteriorly on the middle, and two lines of minute dots on the sides, fuscous; same color underneath, with minute fuscous dots.

Habitat. North Alabama. Under stones.

MICROMMATA PINICOLA.

Plate X. Fig. 14.

Description. Whitish, cephalothorax with the area of the eyes dusky; abdomen with various indistinct curved lines and impressions; venter with two curved lines of brown minute dots. Feet 1. 2. 4. 3.

Habitat. South Alabama.

MICROMMATA SUBINFLATA.

Plate X. Fig. 13.

Description. Livid testaceous; cephalothorax with a dusky longitudinal band; abdomen with angular dusky spots forming a longitudinal band; feet tipped with dusky. Feet 2. $\widetilde{4.\ 1.}$ or $\widetilde{1.\ 4.}$ 3.

Observations. This and the preceding species have considerable affinity with Dolomedes. In fact, it is difficult to trace the exact limits between the two subgenera.

Habitat. South Alabama. In dark places, on the ground.

ATTUS SINISTER.

Plate X. Fig. 12.

Description. Black, varied with rufous; abdomen whitish at base; venter with an interrupted ash-colored band; feet $\widetilde{4.\ 1.}$ 2. 3.

Observation. This spider should be placed in my tribe of the Luctatoriæ.

Habitat. Alabama.

ATTUS RETIARIUS.

Plate X. Fig. 11.

Description. Livid greenish; cephalothorax with an indistinct brown spot; abdomen with two abbreviated brownish bands, approaching towards the apex.

Observations. This Attus was discovered and delineated by my son, Charles A. Hentz, whose attention is more particularly drawn towards the study of Ichthyology. He found the female devouring her male. I believe the markings of the male differ from those of the female. It belongs to my tribe of the Metatoriæ.

SYNEMOSYNA NOXIOSA.

Plate X. Fig. 10.

Description. Piceous; abdomen very slightly contracted near the base, with an interrupted whitish line across. Feet 1. 4. 2. 3.; first pair stout.

Habitat. Alabama.

SYNOPSIS OF GENERA AND SPECIES.

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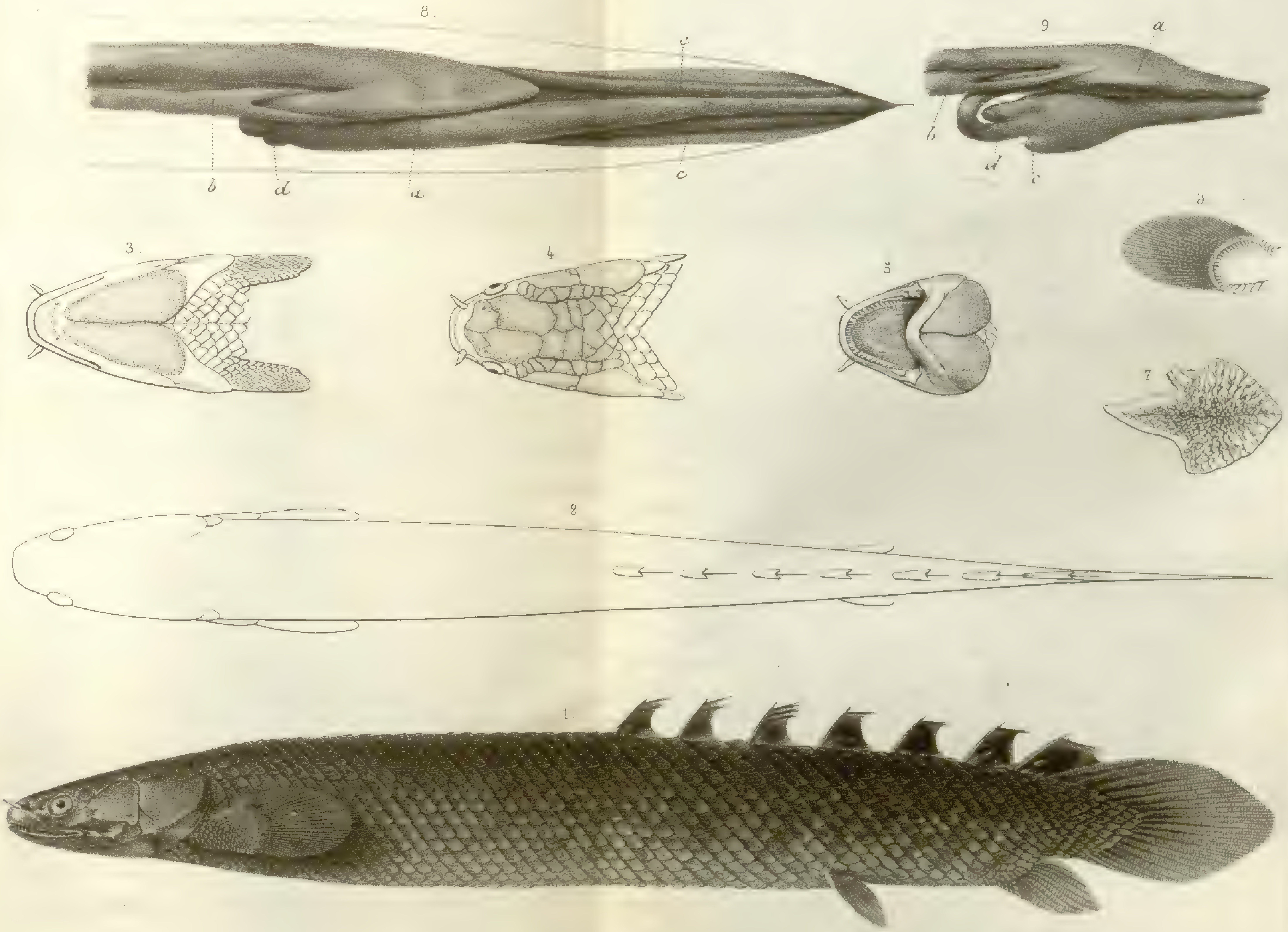
ERRATA.

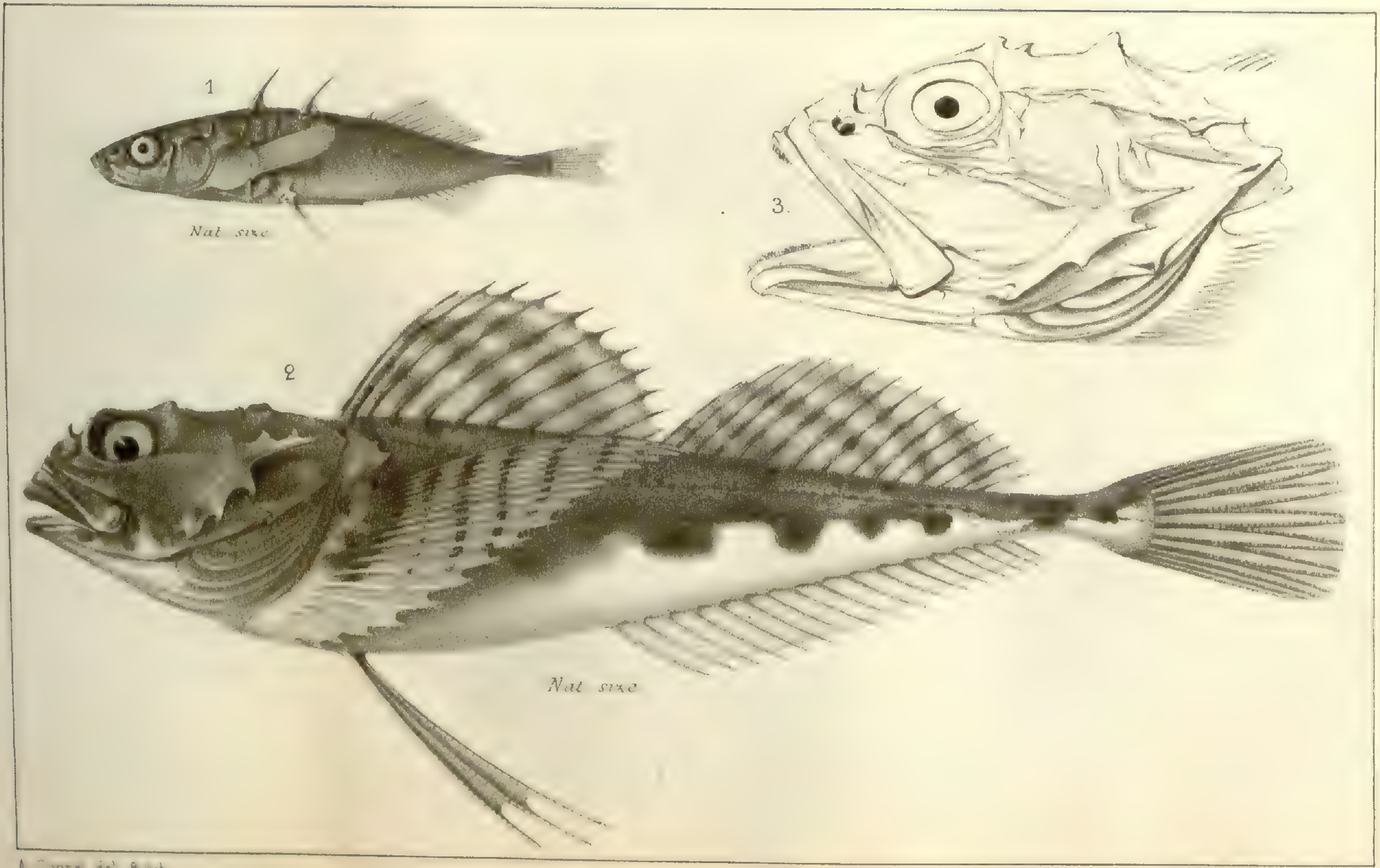
For ART. I. p. 141, read ART. XII.
" " II. " 241, " " XIII.
" " XV. " 247, " " XIV.



A. Sonrel on stone from nat.

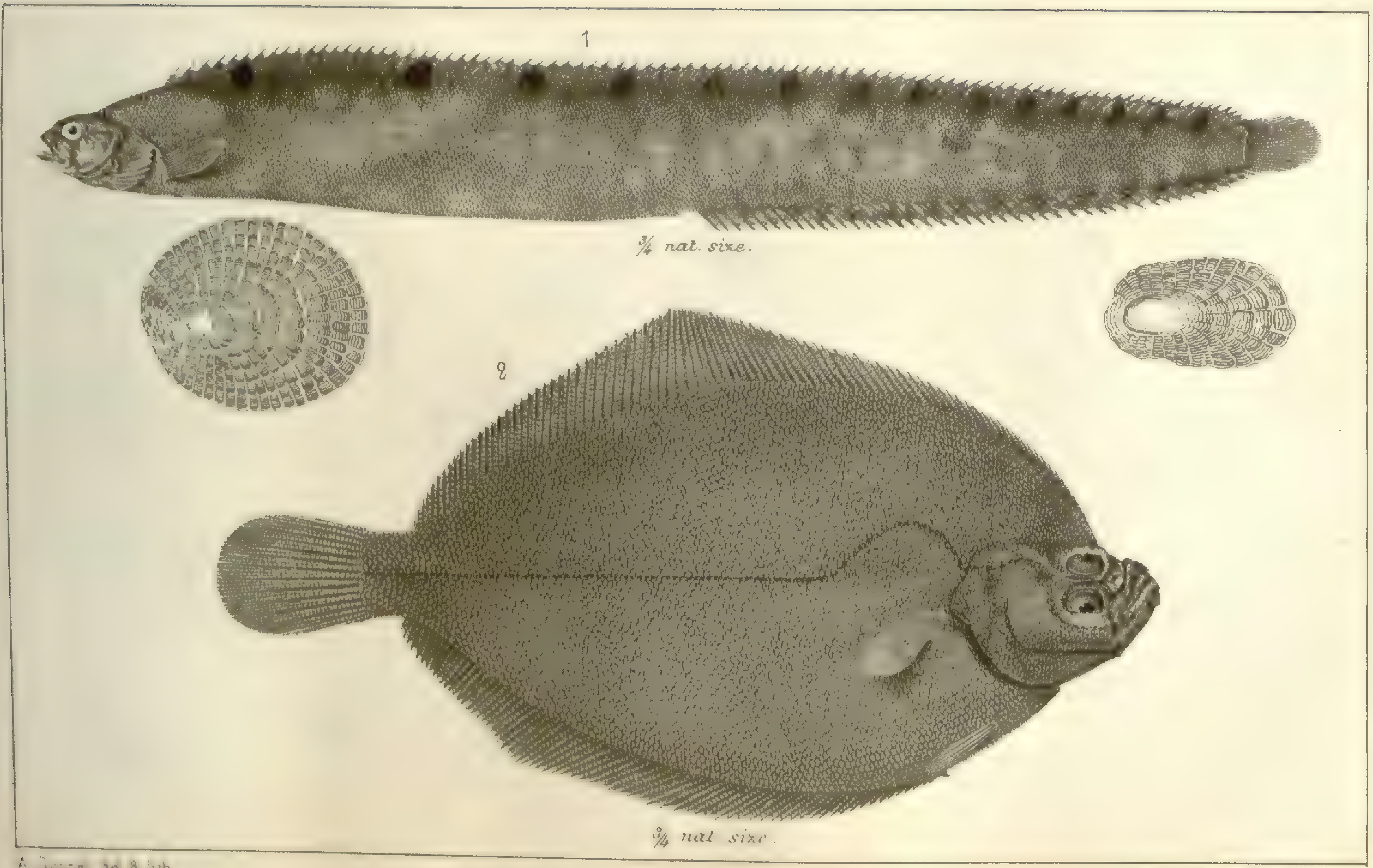
Tappan & Bradford's lith.

POLYPTERUS PALMAS. AYRES.



A. Sonrel, del. & lith. Tappan & Bradford's lith.

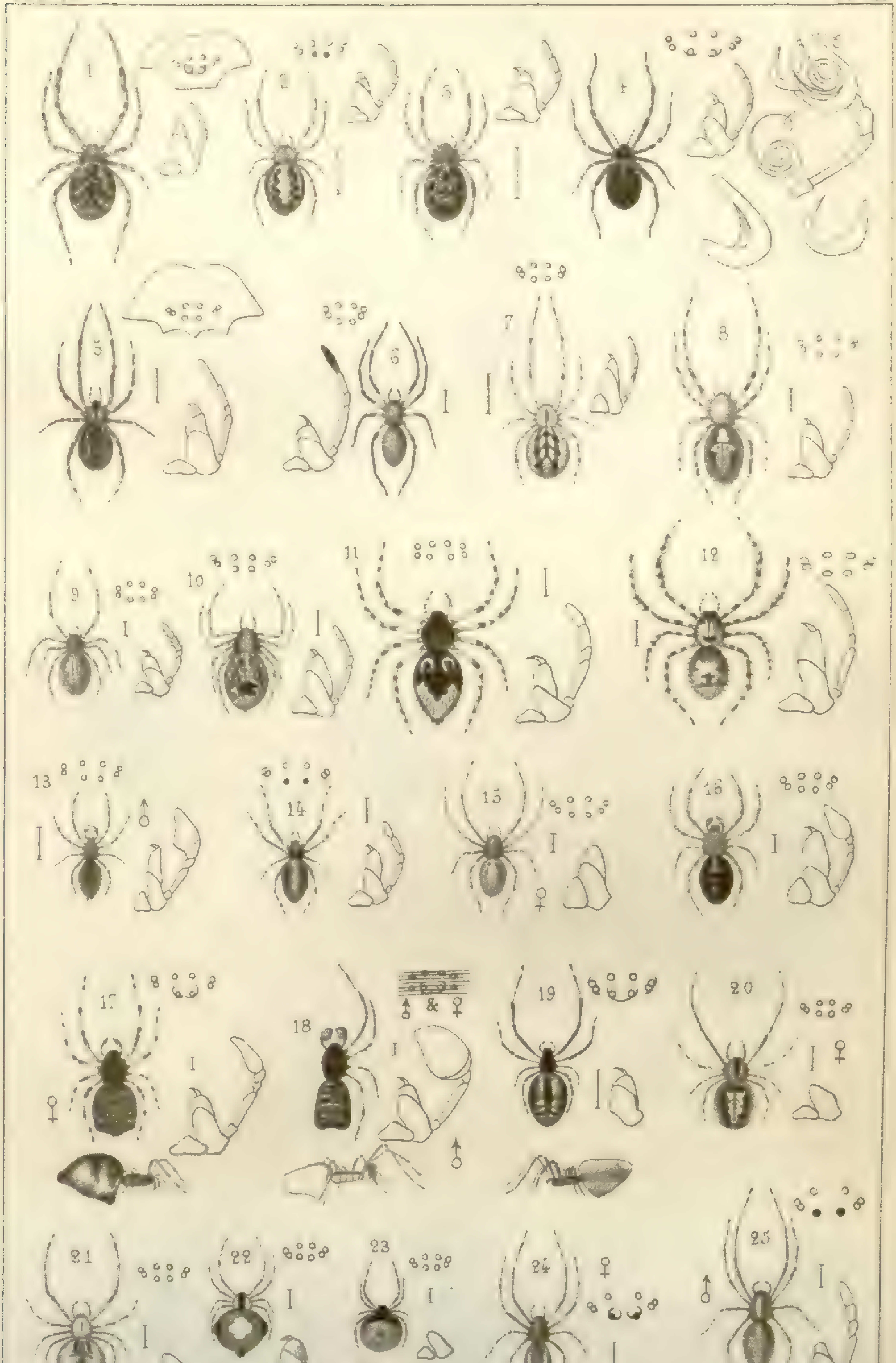
2. ACANTHOCOTTUS PATRIS H. R. Storer.– 3. A. LABRADORICUS Girard.– 1. GASTEROSTEUS CUVIERI. Girard.



A. Sonrel del. & lith

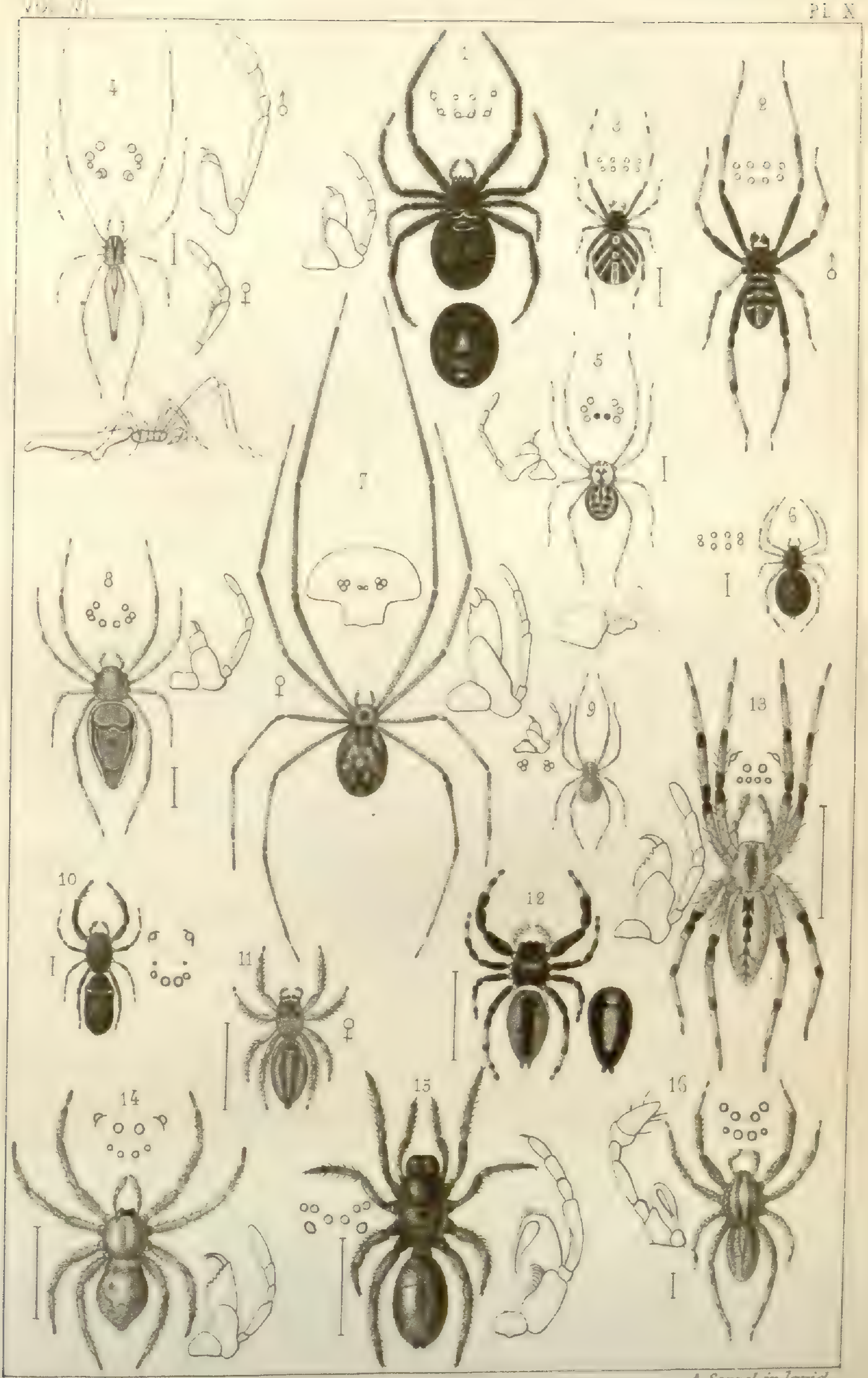
Tappan & Bradford's lith

1 GUNELLUS INGENS H.R. Storer. — 2. PLATESSA ROSTRATA. H.R. Storer.



N. M. Hentz del. *A. Sonrel in lapid.*

Hentz's Araneides of the U.States.



N. M. Hentz del. A. Sonrel in lapid.

Hentz's Araneides of the U. States.

BOSTON

JOURNAL OF NATURAL HISTORY.

VOLUME VI.—NO. III.

Art. I.—*A few Ornithological Facts, gathered in a hasty Trip through portions of New Brunswick and Nova Scotia, in June,* 1850. By T. M. Brewer, M. D.

In the earlier part of the summer of 1850, I spent a few weeks in portions of the Provinces of New Brunswick and Nova Scotia. My object was to observe, as far as it was practicable in so short and hasty a visit, the habits of some of the species of birds which breed to the north of us. In this I was successful, even beyond my expectations. At the same time some facts of interest, connected with the habits and distribution of a few species of birds, came to my notice, some confirmatory, others in contradiction of the testimony of writers upon the subject. I have been urged to embody these observations in a communication to this Society, and have endeavored to do so in as brief and connected a manner as circumstances permitted. The subjects of these desultory notices are not given in any natural order, but as they were brought to my notice.

ELDER DUCK (*Somateria mollissima* Linn.)

On the 16th of June we found three nests of these birds on two small uninhabited islands near Grand Manan. They contained no down and were without eggs. They had either been recently robbed, or the females had not begun to lay. A small flock was to be seen in the neighborhood, but they were very shy and unapproachable. The nests were composed of dry grass, and placed within a few feet of high water. Owing to the constant persecutions to which they are subjected, it is highly probable that in a few years they will be driven away entirely from these islands in the breeding season, and be compelled to seek more inaccessible places. Not many years ago they were quite abundant, and several pairs bred each year on two small islets known as the Green Islands. As it may be interesting hereafter to note the time of their final disappearance from their now extreme southern breeding place, I have thought it not amiss to note the fact, that at least three pairs of these birds were remaining there as late as the present summer, the last of a once numerous family; but it is very doubtful if any of them succeeded in raising their broods in safety.

Audubon found them, in 1833, breeding in the same vicinity as early as the 31st of May, and in much greater numbers.

HARLEQUIN DUCK (*Clangula histrionica* Linn.)

Mr. Audubon, in his account of this bird, speaks of it as breeding on the Seal, White-Head, and Grand Manan Islands, and along the coast of Nova Scotia. Although he subsequently speaks of actually finding a nest of the bird, and the time and place of finding, I am constrained to believe, by the result of all my inquiries, that he was altogether mistaken. That he found a nest and eggs, as he states, on the 31st of May, 1833, I do not doubt; but I think he must have been induced, on insufficient ground, to pronounce them

those of the Harlequin Duck. On the contrary, I was assured by an experienced gunner, who accompanied Mr. Audubon in his excursions that year, not only that they found none of these birds, but that in all his experience he never met with any in the breeding season in that part of the country. In this, his statement was confirmed by all the answers to my inquiries upon this point. In some cases the experience of my informers went back sixty years, and in all the answer was, that instances of these birds, called there "lord and lady," — remaining to breed, were entirely unknown. Beside the Eider, the only birds of this kind known to breed among these islands, are the Dusky Duck (*Anas obscura*) and the Red-breasted Merganser. It is probable that a nest of one of the last was mistaken for that of the Harlequin Duck. It is also doubtful whether the Harlequin breeds in the localities indicated. All my inquiries met with assurances contradictory of this, and go to show that they breed in the vicinity of inland ponds and rivers, and never in the neighborhood of the ocean, and only in high northern latitudes.

FORKED-TAILED PETREL (*Thalassidroma Leachii* Temm.)

So little is known of the manner of breeding and the habits of this interesting bird at the period of incubation, that I trust I may be excused if I am somewhat minute in regard to it. Along the extreme eastern coast of Maine, and in the Bay of Fundy I found it extremely abundant. In the violent storm which attended my passage to Eastport, they were flying about in great numbers, and always by pairs. They flew with great rapidity, apparently but just above the surface of the waves, — which were running very high, — and seemed at times to be skimming their tops for food. I was gravely assured by the sailors that these birds were only to be seen in storms, but that in bright sunshiny weather they disappeared, no one knew whither, and that how they raised their young, or where, was also a thing unknown. A few days,

however, gave me ocular evidence how fanciful were all these legends of the "Mother Carey's Chickens," and how easily better information might have been obtained. I was four days among the group of islands clustered around Grand Manan, and there I found these birds preparing to breed in considerable numbers. Duck Island, where I chiefly staid, is a small, inhabited island. Here the Petrels are much disturbed by cats, dogs, and boys, and partly in consequence of these annoyances, I presume, they were more dilatory in their family arrangements than elsewhere, on the uninhabited islands in the same group. Although it was as late as the middle of June, I could with all the diligence I could employ, find none on that island that had begun to lay. They breed in holes in the ground, in hollow roots of trees, and in similar places. In some instances these excavations were apparently made by the birds themselves, with great labor, which it must have taken some time to perform. Part of the island is wooded, and the roots, above ground, and exposed to the inclemencies of the weather were, to a great extent, decayed and hollow at the centre. These roots I found to be their favorite place of resort, and there they were safe from all their enemies but man. They emit a strong and peculiar odor, and by it are easily tracked with a dog, or even without one, with one's own olfactories. In all instances where I observed the Forked-tail in its breeding-places, prior to depositing its solitary egg, I found the pair closely huddled together, apparently passing a loving honey-moon. On the 16th of the same month I found the same birds in their breeding places on Green Islands, which are uninhabited. There I found only females in their burrows sitting each on a single egg. I did not succeed in finding more than one egg in a nest, nor where there was an egg, more than one bird. It is possible the males were in quest of food for their mates, but I saw no signs of them. The holes are usually several feet in length, but are near the surface of the ground in their whole extent. In one instance the burrow, after extending

nearly four feet, within a few inches of the ground, was found to descend again, and, retracing its course, about two inches below the first passage, to terminate just below its opening at the depth of six or eight inches only, although the whole passage leading to it was eight or ten feet in length. How much time and hard labor this must have cost these birds, webfooted as they are, and but poorly supplied with means of excavating! At the end of this labyrinth I found a snug little chamber of about four cubic inches. It was close and offensive,—for the Petrels seem to appreciate the need of caloric more than of good ventilation. A neat, soft, and warm nest, constructed of fine grass, roots, and a few feathers, protected the egg from the cold soil. The egg is quite large for the size of the bird, pure white, when fresh and unsoiled, oblong in shape, and of uniform size at either end.

The Forked-tailed Petrel of our coast is supposed to be identical with that of Europe. It may, however, not be amiss here to state, that there is a noticeable difference in size between the eggs of the European and the American birds, those of the latter being much larger. Whether this is accidental, or indicative of a specific difference, is a point worth determining hereafter by a comparison of the birds.

The weather, during my stay in these islands, was remarkably fine, and I saw none of these birds by daylight, except when found secreted in their holes. I was, however, assured that in foggy, and in stormy weather, they come out of their retreats and fly about in great numbers. At night, also, they leave their hiding-places, and as they fly about the island, and over the water, utter a low, plaintive cry, like the half articulate wailing of a child. A more mournful or saddening sound can hardly be conceived; and no one who has heard it, by the hour together, and from hundreds at a time, can ever be at a loss to account for the legends of unearthly beings and mysterious sounds with which northern shores, frequented by these spectral visitants, abound. I challenge even the stoutest disbeliever in ghosts and spirits to land at mid-

night upon an island frequented by these birds and listen to their incessant cries, unknowing whence they proceed, without having his unbelief somewhat shaken for the moment.

The Petrel rises with great difficulty from the ground and only very obliquely. Though it can fly with great rapidity horizontally or in an oblique direction, its wings are not adapted to an upward flight. It can, therefore, be easily caught by an active dog, when driven from its retreat, before it can rise beyond his reach. When taken alive it ejects from its throat a yellow, offensively fetid, oily fluid, which seems to be its principal means of defence. It will also bite furiously, though the weakness of its slender bill renders its bite harmless. Except the permanently offensive odor it leaves behind it, I am not aware that the fluid it ejects upon its assailants has any power to harm. The fishermen believe it to be poisonous, blinding to the eyes, and even fatal in certain cases, and under peculiar circumstances. I am confident this is not the case, as I have seen it thrown full upon the face with no other effect than a slight momentary burning sensation, soon removed by a free use of sea-water.

HERRING GULL (*Larus argentatus* Brün.)

Mr. Audubon, in his history of this bird, gives an interesting account of his visit to White-Head Island, and there finding this bird breeding in trees. He had been informed, previous to this visit, of what he would there see, but had anticipated finding some mistake on the part of his informants. That large, clumsy, webfooted birds, like the Herring Gull, could be induced by any pressure of circumstances, so far to depart from their natural habits and those of their whole family, as to construct for themselves nests in high trees in the manner of land birds, appeared almost an impossibility. The result verified, however, the correctness of his information. He found the Gulls in large numbers, with well-constructed nests in high trees. He was informed by the proprietor of

the island that this strange habit had been acquired by the Gulls within his recollection, and in consequence of the annoyances to which they were subjected in the constant robbery of their nests. It is worthy of noting here, that all Gulls, without any exceptions that I am aware of, invariably nest upon the ground. Even the Herring Gull is not known to make nests in trees elsewhere, and in Europe, where it is as common as in this country, it is not known ever to have thus deviated from its natural habits.

The account given by Mr. Audubon has been severely commented upon in several foreign publications, and several writers have treated his narrative as fictitious, or at least exaggerated. It is on this account that I have thought it worth referring to, as I have it in my power to confirm its truth and correctness in every respect. Not only in Whitehead island were the Herring Gulls found breeding in high trees, but also in a group within a few miles called the Two Islands, the same change of habit was noticed to even a much greater extent. On the last islands the proprietor annually derives a handsome sum of money from the sale of their eggs, which are gathered by the members of his family. The eggs when fresh are, in my estimation, a great delicacy. Several nests, which I examined, I found to be constructed with wonderful nicety, when we regard the clumsy web-feet and large bills with which all these materials are gathered and woven into shape. They are constructed of coarse reeds and grass, lined with somewhat finer kinds. They use no sticks, at least they did not in any nests that I saw. They are quite deep, soft, and warm. In one which had been thrown down to me for examination from the height of over thirty feet, supposed to be empty, I found a freshly-deposited egg, unbroken, which I have still in my possession. This fact will confirm the accounts of the size and thickness of the nest and the labor bestowed in its construction by birds so ill-adapted by nature to such work, but driven to it by the persecutions and robberies inflicted upon them by man. If any are still in-

credulous of these singular facts, they may easily satisfy themselves of their entire accuracy another season, as both of these islands are but about thirty miles from Eastport, and quite accessible. I ought, perhaps, to add, that although this remarkable change of habit is noticeable in a large proportion of the Gulls breeding in these islands, it is by no means universal. Some still adhere to their natural promptings and lay their eggs on the ground. This is still the case without exception with the *Larus leucopterus*, a few of which are found in this vicinity and breed on the same islands.

HERMIT THRUSH (*Turdus brunneus* Gmel.)

About six years since, my attention was called, by Mr. Spencer F. Baird, of Carlisle, Pa., to the fact, that two separate and distinct species of birds are confounded together under the name of Hermit Thrush. I subsequently prepared a paper which I read to the Society pointing out the specific differences, and which was intended for publication. So close is the approximation of these species, however, that there appeared to be some doubts in the minds of some members, as to the certainty of the differences being specific, and the paper was withdrawn until the eggs of the two species could be obtained, and their distinctness be thus confirmed. In the meanwhile, however, the subject was taken up by Mr. Giraud, of New York, in his "Birds of Long Island," who gave to the undescribed species the name that had been proposed, — *Turdus olivaceus*. As this has already been twice preoccupied, it cannot stand, and by the rule of priority, the name of *Turdus Swainsoni*, given it by a German ornithologist, will claim a preference. My attention was first called to the subject by finding, in Roxbury, several years since, the nest and egg of this bird. It differed entirely from the description of it by Wilson. This was the more noticeable from the fact that he spoke with so much particularity of the place, date, &c. of his finding it. His nest was in a tree,

and the eggs were spotted. The one I found was on the ground, and the eggs without sign of spot. His description I could not reject; his character for accuracy and for truthfulness would not allow it. It seems therefore to indicate specific differences which the result has confirmed. The nest and eggs he described belonged undoubtedly to the fox-colored species; those found in Roxbury to its olive-backed congener. Still it was possible he might have been mistaken, and new evidences were required to confirm his descriptions. These I was so fortunate as to obtain this summer. On the 15th of June, some of the boys enlisted in my service found a pair of the fox-colored birds building a nest on Duck Island. We watched them carefully until the morning of the 18th, when the time for my departure had come, and to my great satisfaction, one egg was found; it corresponded exactly with the description of Wilson. A few days afterwards, in Halifax, I mentioned these facts to a naturalist there, Andrew Downes, and found that he was perfectly well aware of the specific differences of these birds. He has procured and sent me the eggs of each species. It has contributed, no doubt, to the confounding together of these distinct species, that both have about the same geographical distribution and similar habits. They are both northern species, only occasionally found south of the extreme northern limits of the United States in breeding season, but each in a few instances having been observed to deviate from this general rule.

I do not propose here to go into the particulars of the specific differences. Yet it may be well to give a few of the more prominent distinctions. The olive-shaded bird is larger and heavier, and builds on the ground; its eggs are larger, uniform in color, which closely resembles that of the eggs of Wilson's Thrush, but much more nearly spherical, and unspotted. The fox-colored bird is less heavy in its make, builds on trees a very peculiar nest, recognizable at once, whether found in Georgia or Nova Scotia; its egg is lighter, much more oblong; its ground color less deep, and beautifully spotted with

golden brown. The notes of both birds vary unmistakably. Both are sweet singers, so sweet that I have no preferences to give.

COMMON SNOW BIRD (*Plectrophanes nivalis* Linn.)

Wilson, in his account of this familiar little bird, speaks of it as "half domesticated," in consequence only of the inclemency of winter and the necessities caused by the season. Carrying out this idea he assumes, that "there must be something in the temperature of the blood or constitution of this bird which unfits it for residing during summer in the lower parts of the United States," and conjectures that, "perhaps its habits of associating in such numbers to breed, and building its nest with so little precaution, may, to insure its safety, require a solitary region, far from the intruding footsteps of man." Mr. Audubon, speaking of the same bird, in his first edition, went a little farther, and said that nothing was known of its breeding-places. Although this was corrected in his later publication, Mr. Gould, who includes this among his "Birds of Europe," repeats the idea, that its breeding-places are unknown, and some very pretty pieces of poetry have been based upon this idea of its fleeing "far from the intruding footsteps of man," although in winter it seems so familiar and confiding. I am sorry to have to destroy so poetical and so fanciful an illusion, but the truth is the reverse of this. In the first place, the bird does not "associate to breed." At that period all its propensities to socialism are for the time at an end, and like other birds the flocks separate into pairs. While it breeds abundantly in the high lands of Virginia, Pennsylvania, New York, and New England, it is found also in the low lands, breeding as far south as Brunswick, in Maine. So far from being a shy or unfamiliar bird in the season of its breeding, no bird is more the reverse. No bird throughout Nova Scotia is more familiar or a greater pet than the little "Blue Bird," or "Blue Sparrow," as it is there called. It frequents instead of shunning the abode of man.

In the very heart of the city of Pictou, an intelligent and scientific naturalist, Mr. Dawson, showed me three nests of these birds, constructed, not merely near his house, but actually within the house itself, on beams in his woodshed. Similar facts came repeatedly to my notice. Our little Chipping Sparrow is hardly so confiding and familiar as is this bird throughout that whole section from Eastport to Pictou.

TREE SPARROW (*Zonotrichia monticola* Gmel.)

Mr. Audubon, speaking of a nest and eggs given him as belonging to this bird, says, "the eggs were of a uniform deep blue, so closely resembling those of the common Chipping Sparrow, that had they not been much larger, he might have concluded them to have been those of that bird." In this there is evidently some misapprehension. The egg of the Tree Sparrow, in every instance where I have obtained it, is not larger, but smaller, than that of the Chipping Sparrow. It is not uniform in color, but spotted and lined with dark brown. Its ground color is distinctly shaded with green, not with blue. Nor, if uniform in color, would it resemble the Chipping Sparrow's eggs. Both eggs are spotted, but vary in their ground color. Nor does the nest he describes seem to correspond with that of the Tree Sparrow, but rather with that of the Purple Finch; and, but that he speaks of the uniformity of the color, it might be supposed the nest and eggs he speaks of were in reality those of the latter bird.

I was struck with the singularly separate geographical distribution of these two Sparrows, so much alike in all other respects. The Chipping Sparrow is one of the most common birds in the northern portion of the United States; but wherever it is found in the summer we never find the other. Proceeding north, beyond a certain point, all at once we miss this bird, and, almost at the moment we cross the line that it does not pass, we find its congener, so

closely resembling it, that a careless eye might never note the difference. Both birds are apparently alike in habit, food, nesting, and strongly alike also in external appearances. Why should they not also dwell together in the same places? No law of nature is apparently more fixed than this; but why it is so is one of the many inscrutable facts, which, the more we seek to understand, the less are we able to explain them.

Art. II.—*Notice of the Egg of Thalassidroma Leachii, with Descriptions of the Eggs of Procellaria Bulwerii, Procellaria obscura, and Puffinus major.* Read before the Boston Society of Natural History. By T. M. Brewer, M. D.

In the paper which I read a few weeks since, I referred to the marked difference in size between the specimens of the eggs of the Forked-tailed Petrel obtained in the Bay of Fundy, and one given me as a European specimen of the same. It suggested the possibility of specific differences which seemed worth investigating. Since then I have received information which convinces me that there is no real difference between the eggs of the European and the American birds, and that the egg given me, in the first instance, and referred to in my paper as that of Leach's Petrel, is not the egg of that bird, but of a smaller species. The day after my communication was read I received a letter from a correspondent in Manchester, England, to whom I had sent a specimen of the American egg, and had mentioned my suspicion of the possible existence of specific differences between the birds of the two continents. He wrote me in reply, that it corresponded exactly in size with the European specimen in his cabinet. Since then I have received from another corres-

pondent an undoubted specimen of an European Fork-tail, or Leach's Petrel's egg, which is conclusive as to the fact, that if there be any difference in the size of the eggs it is not in favor of the American.

The specimens which I obtained from the Bay of Fundy measure $1\frac{5}{16}$ of an inch in length, and are exactly an inch in their greatest breadth. The specimen from Europe corresponds in length, but is at least $\frac{1}{16}$ of an inch larger in breadth. This correspondence of the eggs points to the probability of their identity of species, which their great powers of flight, their maritime life, and the proximity of their haunts, as well as their close resemblance, serve to confirm.

In the same package which brought me the egg of the Fork-tailed Petrel, I received also the eggs of three species of birds, which, until the past summer, have been entirely unknown to naturalists. As no description of them has, to my knowledge, ever been given to the public either in this country or in Europe, I have thought a brief one might be interesting, especially as the birds themselves also are rare and but little known, and as in regard to two there has been much confusion. The first egg is that of

Bulwer's Petrel (*Procellaria Bulwerii*, of Jardine and Selby; *Thalassidroma Bulwerii*, of Gould and Yarrell.)

This bird is included in but three or four works on European ornithology, and in these only on the strength of three instances of accidental occurrence; one of which was in England, the others were on the continent. Its true habitat is the seas bounding the western shores of Africa. It is abundant in Madeira and the adjacent islands, from which the specimens sent to me were obtained.

These measure $1\frac{11}{16}$ of an inch in length by $1\frac{1}{4}$ in breadth. They are of the purest white in color, and entirely free from the musky odor peculiar to the eggs of all other species of this genus that are known. They also differ in shape somewhat from the eggs of their kindred species, the latter being

rounded and of equal size at either end. The Bulwer's is frequently quite pointed at one end, and in all the specimens obtained one extremity was perceptibly sharper than the other; not to the same extent, however, as in the eggs of most birds, but much more so than in others of this family.

DUSKY PETREL (*Procellaria obscura*, of Gmelin and Temminck, &c. *Puffinus obscurus*, of Vieillot, Audubon, Bonaparte, &c.)

With regard to the geographical distribution, habits, and manner of breeding of this bird, nothing is known with certainty. It is not recognized by Yarrell as a bird of the British islands, and Temminck only claims it as an European species, on the strength of two specimens, one obtained on the coast of Bretagne, the other on that of Picardy, in France.

Its claim to be ranked as an American species, if we carefully rely upon our authorities, is, apparently, less doubtful. The Prince of Musignano, in his geographical and comparative List of the Birds of Europe and North America, speaks of it as accidental on our central coast. Mr. Audubon, however, speaks of having found it quite common in June off the western shores of Florida, in the Gulf of Mexico, and afterwards of having seen it off Sandy Hook. De Kay includes it among the birds of New York, and speaks of its having been obtained on the coast of Long Island.

The egg, which I received from a reliable source, and which I believe to have been entirely unknown to naturalists before the last summer, measures exactly 2 inches in length by $1\frac{7}{16}$ of an inch in breadth. It is of a uniform dark cream-color, oval in shape, and very nearly of the same size at either end; not pointed, and more oblong than spherical in shape. Its place and mode of breeding I am not for the present at liberty to give, for reasons explained below.

The GREATER SHEARWATER (*Puffinus major*, of Faber, Yarrell, and Temminck. *Puffinus cinereus*, of Gould, Audubon, Bonaparte, &c.)

A good deal of confusion relative to this species has prevailed in all works upon European ornithology, caused by blending together what are now supposed to be two entirely distinct species. Temminck was the first, in the third part of his Manual, to make this separation, and to indicate the specific differences between the true *Puffinus cinereus* and the *Puffinus major*, of Faber. The former is a bird found in abundance in the Mediterranean, breeding in and around Corsica, but not known to have been found in the British islands, on the Atlantic coast of Europe, or in America.

The latter is stated by Temminck to be abundant in high northern latitudes, and among other places he speaks of Newfoundland as one of its localities. It is, however, spoken of as rare in Iceland, and but few instances are known of its having been obtained in Great Britain. The statement of its abundance on the coast of Newfoundland, I am inclined to believe, needs confirmation and is probably not correct. It is undoubtedly an American bird, and is the same as that referred to by Audubon, Bonaparte, &c. under the name of *Puffinus cinereus*. The name of *Puffinus major*, Greater Shearwater, given it in the first instance by Faber to distinguish it from the common Manx Shearwater, *Puffinus Anglorum*, and retained by Temminck and Yarrell, is not well chosen, as the bird is two inches shorter and is smaller than the *Puffinus cinereus*, with which it has been confounded.

Audubon speaks of having seen it in abundance off the coast of Nova Scotia, but as he obtained no specimens it is quite possible he mistook some other bird for this species.

De Kay includes it among the birds of New York, and speaks of it as an accidental visitant. In this he is probably correct, and I think the result will show that the same is true of nearly our whole coast, and that it is not only not an exclusively northern species, but more southern than northern, a great wanderer over the ocean, visiting both shores of

the Atlantic, but breeding on neither, in Europe or in North America. I regret that I am not at liberty at present to state more definitely its breeding-place, from which the specimen in my possession was procured. An English gentleman, to whose liberality I am indebted for the specimen of this and the preceding kinds I have described, an ardent, zealous, and liberal Oölogist, who spares no pains or expense to add to the knowledge in his favorite study, and who obtained them last summer, lest he may be interfered with by others, in another year's acquisitions, withholds for the present, permission to give publicity to its breeding-place, and its habits in that connection.

In June, 1846, I obtained a single specimen of this bird on the small, uninhabited island of Muskeget near Nantucket. It was picked up on the beach, and had apparently been dead several days. I had it skinned, and kept it long enough to identify it, but it continued to be so extremely offensive that a gentleman in New York, to whom it was sent for examination, threw it away. I have been told by gunners that it is not uncommon around Nantucket and Martha's Vineyard at certain seasons.

The egg of this bird is $2\frac{29}{32}$ in length by $1\frac{15}{16}$ in breadth. It bears a close resemblance to the egg of the Fulmar Petrel, but is at the same time readily distinguishable by the greater size, the larger proportionate breadth, and the pointed end of the latter egg. In color it is pure white, granulated, but smooth to the touch, very oblong in shape, and one end is slightly more pointed than the other.

The remarkably elongated shape of this egg, if common to all of this species, is a distinguishing characteristic from that of the *P. cinereus*, which Temminck describes as very much rounded in shape, — "*plus ou moins arrondi.*"

ART. III. — *Description of Five new Species of Birds, and other Ornithological Notes of Cuban Species.* Read before the Boston Society of Natural History, March 3d, 1852. By JOHN GUNDLACH.

1. MUSCICAPA SAGRÆ Gund. *Pitirre Bobito.* This species is the one wrongly described by D'Orbigny, in the "Physical, Political, and Natural History of the Island of Cuba, by Dr. Ramon de la Sagra, Ornith. p. 72, under the name of Tyrannus Phœbe, L. Pitirre. I give it the name of M. la Sagra, as he was the first to make it known to the public.

Bill long, broad, and depressed, black. Feet brownish black. Iris dusky hazel. Head slightly crested, third and fourth quills longest, fifth a little shorter, second one twelfth of an inch shorter than third, first equal to tenth; tail very long, emarginate; upper parts brownish gray, the head much darker; quills and tail dusky brown; primaries edged with light red, the secondaries with whitish, the primary coverts edged and tipped with whitish, the secondaries tipped with grayish white; outer tail-feathers on the outer web brownish gray, inner webs of the tail-feathers, except the two middle, and the two outer, light red; fore part of neck and breast whitish gray; the rest of the lower parts pale yellow. Male. Length 0.192 mill. Extent of wings 0.270 m. Bill along the ridge 0.017 m. Island of Cuba.

This Muscicapa was described by D'Orbigny as M. Phœbe, and hence it comes that the customs and habits of the latter have been given to the one I have named M. Sagræ. Our species is sedentary, lives in light or open woods, principally on the edges and in the fellings made on estates in this island. From a dry twig he watches for insects; seeing one he darts upon and seizes it, and returning to his perch hammers it against a branch until it is dead, and then

swallows it. Towards the latter end of April or beginning of May this species builds in a dry and hollow branch, or in some hole of a tree, a nest of dry grass and fibrous roots, horse hair, feathers, or vegetable wool, and even with the cast-off skins of snakes. The eggs are four, of a reddish white color, with small lilac and red spots, principally grouped in a circle towards the large end. M. D'Orbigny describes them inaccurately as white, as are those of the true Phœbe. Eggs 0.022 m. in length 0.017 m. in breadth.

2. Muscicapa Lembeyei Gund. *Moscareta parda.* Mr. Lembeye mentions this species in his Birds of Cuba, page 41, under the name of *M. fusca*; but having myself some doubt on the subject, I compared a specimen with a skin of *M. fusca* from the United States, and it was at once evident that the Cuban species is different, not only in the proportional length of the quills, but in the reddish color of the forehead. The bill, like that of *M. fusca*, is black, with the base of the lower mandible whitish. Feet black. Iris dark hazel. Head slightly crested. Third quill longest; fourth nearly equal; second and fifth equal; first and seventh nearly equal; tail pretty long, emarginate. Upper parts brownish gray, the head much darker; quills and tail dusky brown; secondaries edged with whitish; the primary coverts edged and tipped with grayish white, the secondaries tipped with brownish gray; outer tail feathers whitish on the outer edge except towards the tip. Chin and sides of the breast brownish gray; fore part of neck and the other lower parts yellowish white; forehead reddish brown, with a few feathers on the eye lids whitish. Lower wing coverts tinged with gray. In the female the outer edge of the outer tail feather is grayish and the forehead whitish.

Male. Length 0.086 m. Extent of wings 0.278 m. Bill along ridge 0.014 m. Island of Cuba. I have seen but one pair of these birds, near Cardenas, and it was in the month of February, 1846. They lived in a freshwater marsh, amongst the bushes, and hunted their prey like the other

Muscicapas. They lived, however, nearer the ground, and I was not able to hear their note.

3. Orpheus saturninus Licht. *Sinsonte prieto.* I think this species agrees with the description of *O. saturninus* Licht., but as this bird has its home in Brazil, I give it as doubtful till I can compare specimens of the Brazils with those of Cuba. Bill and feet blackish brown. Iris yellowish olive. Fourth quill longest, third almost equal, second and seventh equal. Tail rounded. The feathers of the head sharp. Upper parts grayish brown, the hind neck more gray. The tips of the primary and secondary coverts and the edges of the primary quills whitish gray. Loral space and a dusky line behind the eye blackish. A band from the upper mandible over the eye and the lower parts white, tinged on the breast with gray. Sides of the body marked with brown lines; from the base of the bill a line of dusky spots downwards. Tail grayish brown, the outer feathers with a white spot on the tip. Found on the keys near Cayo Romano.

Male. Length, 0.292 m. Extent of wings not measured. Bill along the ridge, 0.022 m.

4. Corvus minutus Gundl. *Cuervo.* Bill and feet black. Iris chestnut brown. Fourth quill longest, fifth nearly equal, third $1\frac{1}{24}$, and second $1\frac{1}{6}$ inches shorter than the fourth; tail rounded. General color black with purplish blue reflections, the lower parts less glossy and more greenish. The stiff feathers which cover the nostrils straight forwards. Island of Cuba. Not generally distributed. Much resembling the American Crow, but smaller.

Female. Length 0.406 m. Extent of wings 0.774. Bill along the ridge 0.043.

5. Columba caniceps Gundl. *Camao.* Bill whitish, carmine at the base. Feet flesh colored. Iris reddish orange, bare part of face gray, eyelids reddish gray. Forehead grayish white, passing into the gray of the head Neck dull gray with violet green reflections; back bright violet, the hind part of the back blue. Tail and wing coverts brownish black,

glossed with bluish green. The ten primaries on the inner webs and at the base of the outer webs cinnamon colored. Lower parts, from the grayish white throat to the breast, more and more dusky; and from this to the abdomen, which is whitish, paler and paler. The breast is glossed with green and violet, every feather being green with a violet tip. The feathers of the legs, those under the tail and wings cinnamon colored, paler on the tip. Habits like those of Columba montana. Island of Cuba.

Male. Length 0.306 m. Extent of wings 0.526 m. Bill along the ridge 0.014 m.

I will now give some notes regarding Cuban species, of the eggs, nests, and other interesting particulars, of which although they have been described, no mention is made.

Muscicapa or *Muscipeta caribæa* D'Orb. Bobito. Hist. fis. polit. y natural de la Isla de Cuba. Ornith. p. 77. Slightly crested, third and fourth quills longest, second nearly equal, fifth 1 mil. shorter, first shorter than sixth. Tail emarginate. The young birds with the tips of the wing coverts whitish, and therefore resembling the *Muscicapa virens*. Length 0.168. Extent of wings 0.234. In the months of April or May they build their pretty nests on the top of the fork of a horizontal twig. It is constructed of mosses, lichens, fibrous roots, or horsehair, and the interior is lined with hair, feathers, wool, &c. The two or three eggs laid are white, with a crown of lilac and brown dots.

Agelaius assimilis Gundl. Chirriador, or Mayito de la Cienega. This species is very common in the Cienaga de Zapata, S. Coast. It builds its nest in the month of June, in the very same manner as described by Mr. Audubon, of *Ag. phœniceus*. It lays four whitish-blue eggs, with some lilac and dusky spots, 0.025 mil. in length, and 0.018 mil. in breadth.

Corvus Jamaicensis Gmel? Cao. Nests in April and May. The nest is built of little twigs, grass, feathers, or any soft materials, and fixed on the top of parasitic plants, or

on the palm leaves near the trunk. The four eggs are pale greenish, with purplish gray and brownish green spots. Diameter, 0.044 m. in length, 0.030 m. in breadth.

Anabates Fernandinæ Lemb. Chillina. I doubt whether its classification as Anabates is a good one. This species is common everywhere, more so on low lands. In April it busies itself with its nest, made of Guajaca (Spanish beard,) dry grass, and vegetable wool, and if possible on a horizontal twig. Two to three eggs will be found, of a white color, with a faint bluish hue, and marked towards the large end with a crown of little lilac and reddish brown spots. The young ones are like the adult parents. Diameter of egg 0.017 m. in length, 0.014 m. in breadth.

Passerina collaris Vigors. *P. olivacea; L. Tomeguin.* Tomeguin del Pinar. These species breed nearly the whole year round, for I have seen their nests in January, March, April, May, June, July, and August, — and very likely they may do so in other months. The former selects a frondiferous tree in the Savannas (its favorite home) such as Yamáguey, Mábóa, Caoba (Mahogany,) Limon (Lemon,) and the latter prefers a thick bush. Both make out of dry grass, cotton, horsehair, feathers, &c. a large nest, as seen from the outside, furnished with a roof, and having but a small entrance on one of the sides. They lay two or three white eggs, (I have not seen more,) of a greenish hue, and dotted with dusky little spots and a few lilac, which increase near the large end and encircle it. The eggs of both species are alike, and it is only by the difference of size that they can be distinguished. Diameter of egg of *P. olivacea*, 0.018 m. in length, 0.013 m. in breadth: of *P. collaris*, 0.016 m. in length, 0.012 m. in breadth.

Pyrrhula nigra L. Negrito. In the same manner that *Passerina collaris*, Vig. and *olivacea L.* build their nests, so does this little bird build his in the thick foliage of a tree, or on creepers or twining reeds. Three or four white eggs, with a very slight geenish hue, with dots and spots of a pale

brown and lilac, will be found. Diameter, 0.022 m. in length, 0.015 m. in breadth.

Hirundo coronata Mus. Berol. Notwithstanding the description given in p. 46, of Mr. Lambeye's work, of the eggs of this Swallow, I give another on account of a mistake having arisen. They are sometimes white with brown and lilac spots, and at other times reddish brown instead of brown. Diameter, 0.021 m. in length, 0.016 m. in breadth.

Noctua Siju D'Orb. Siju Chico. This species breeds in April in hollow trees or palms, laying at the bottom of the hole, without building a nest, three or four eggs, nearly round and of a pure white. Diameter not measured.

Xanthornus dominicensis L. Solibio. This species nearly always builds its nest in a most artificial manner, from threads of palm leaves, knit under the horizontal ones that adorn this tree, sowing them for this purpose in a most curious fashion, leaving a lateral entrance. In this airy structure they lay four eggs, bluish white, with little dots of a grayish violet, principally towards the large end. Sometimes they are found with large brown dots. When there are no palms in the neighborhood they build their nests amongst the leaves of parasitic plants; and I have even seen one in a bunch of the Mango fruit. Diameter, 0.025 m. in length, 0.018 m. in breadth.

Turdus rubripes Temm. Zorzal de patas coloradas. Its nest is made of grass and dry leaves, and lined with vegetable wool, horsehair, and feathers; this species builds either in large holes of trees or palms, or on parasitic plants, or amongst the new shoots of a horizontal branch and sometimes amongst thick and frondent branches. Its three to five eggs are greenish white, with spots of a reddish brown and pale violet, which increase towards the large end. Diameter, 0.032 m. in length, 0.024 m. in breadth.

Tyrannus caudifasciatus D'Orb. *T. matutinus* Vieill. *dominicensis* Br. Pitirre. In April, May, and till July, both these species build their nests with slender twigs, and fibrous roots,

and line it with horsehair, cotton, &c. Their structure is so slight and transparent, that their eggs may be seen through them from beneath. They are from two to four, of a reddish white, with a circle of ash-gray, violet color, and dusky spots on the large end. Diameter, 0.026 m. in length, 0.018 m. in breadth.

Trogon Temnurus Temm. Tocoloro. This beautiful bird does not trouble himself about building a nest, but seeks the deserted habitation of some Woodpecker. From April to July is the breeding season, and the eggs are three to four, of a white color, with a bluish tinge. Diameter, 0.031 m. in length, 0.024 m. in breadth.

Saurothera Merlini D'Orb. Arriero. On coffee trees and other branchy shrubs, this species builds its nest, without any art or cunning, its materials being merely twigs, lined with a few dry leaves. The three eggs are of a dull white, with some brownish spots, which, I think, appear after the eggs are laid.

Art. IV. — *The Organic Relations of some of the Infusoria, including Investigations concerning the Structure and Nature of the Genus Bodo* (Ehr.) Read before the Boston Society of Natural History, November 5th, 1851. By W. I. Burnett, M. D.

The changes which we are now experiencing as to our views of the nature of minute organisms, must be regarded as a sign of the advancement of our knowledge in more than one direction. The removal of obscurities in these departments is a matter of more difficulty and importance than is generally supposed, and is indicative of the possession of ampler and better means of observation, combined with clearer views of the relations of organic life. This is particularly true of the subject of Infusoria; which, although in a more

unsettled state than ever, is probably fast getting into a better scientific condition.

Our views of the relations which the labors of Ehrenberg in this connection hold to science, are quite different from what they were a few years since. In the department which he has really made his own, we have been accustomed to regard his results as scientifically complete as far as they go, and as forming a foundation on which future experience was to erect the structure. But now the case stands differently, and his vast and constant labors must be looked upon in the light of opening to our view a vast field of inquiry, the details of which are to be definitely understood by the more recent advantages of observation. Had Ehrenberg merely described the various forms he saw, without attempting any of those broad generalizations of their organic relations, there can be no doubt that our knowledge in this department would have been much farther advanced than it now is; for, his authority on this subject, has, until lately, been so great, as to preclude any thing but an acquiescence in his views, whatever might be the phenomena observed.

I am well aware that these remarks embrace the opinions of others as well as of myself, and this is one reason why I do not hesitate to express them. But I have been led to note them here, from a review to some extent, which I have been recently making, of these matters, by the aid of the best means afforded at the present day.

Those who have been laboring in this direction, either taking it up directly, or who have been led into it by kindred studies, such as those of Embryology, &c. have concluded that the class *Infusoria*, as it now stands, contains the most heterogeneous elements; and that, *before it can assume a true scientific aspect, it must be completely worked over.* In organic science the highest scientific end cannot be attained by the mere recognition of a form, and giving it a name, but, by the perception also of the relations which that form sustains to allied forms, and those quite different.

In these studies, two questions are constantly presenting themselves, concerning these minute forms, namely, — 1st. Are there any definite characteristics whereby that which is of an *animal*, can always be distinguished from that which is of a *vegetable* nature? 2d. With regard to those of an animal nature, what do they need, that they may be regarded as true animals, having individualities of their own complete? I do not think, that, in the present state of our knowledge, either of these questions can be decided; nevertheless, we already have data sufficient to enable us to decide satisfactorily in many instances, but the data most precious have not yet been found.

It is well known that many of those distinctions hitherto insisted upon, as to animals and vegetables, are now regarded as invalid; such, for instance, was *motion*, which was supposed to belong to animals and not to plants, but this is now known not to be the case. It was then, and is now urged, that *voluntary* motion is to be the distinctive feature; but this appears to obscure the matter still more, for individuals can never agree as to what, in these minute particles, is voluntary and what is involuntary. And in particles, which, from every reason, I have believed to be vegetable, I have seen motions just as *adaptive* as in other particles which I had equally as good reasons to believe were animal.

In regard to the 2d question, — What characteristics in organic animal matter shall constitute it an individual, I feel satisfied of this much, — that cell-processes, however closely interwoven they may be with the expressions of individual life, cannot be considered as constituting the groundwork of its definition. And when I speak of cell-processes, I mean their growth and development, their multiplication by segmentation, and their transition into tissues. I base this remark upon what I have observed. The ovum, for instance, originally a cell, and developing by the increase of cells, undergoes segmentation and multiplication of its contents, and in one sense may be said to be alive; yet it does not

possess an individuality until it has been fecundated by the semen.

Cartilage, epithelial and other cells, undergo similar processes. Yet they have no individuality of their own, for they can play no part in physiology unless attached to the organisms to which they belong.

These examples illustrate pretty well the distinction I wish to draw between animal organic matter, possessing organizing forces, and animal organic matter possessing the individuality of life; and this is no metaphysical distinction, for it really exists in nature. On this account, I say, that if in Infusorial studies, we meet with free, moving particles, and even having a motion apparently adaptive, and increasing in numbers, by the endogenous formation of cells, we cannot, from these data, say that they are individual beings; on the other hand, in the present state of science, they are rather to be regarded as *organic particles.*

These remarks are applicable to what I now wish to say concerning some investigations I have recently made upon the family of *Monads* (*Monadina*) of Ehrenberg. As it now stands, undoubtedly it includes very heterogeneous elements; particles being grouped together from their general aspects, rather than from their physiological characteristics. I cannot pretend to take them up in that systematic way in which they have been arranged by Ehrenberg, for I have found but little system about them, and, for the most part have been unable to follow his descriptions. If we are to judge of them by mere form and size alone, I should say that the variety that passes under the eye of the microscopist is endless. Indeed, in watching the same particle, for a long time, I have seen it change its form and size four or five times, and each as distinct from the other, as many of Ehrenberg's species. Those which contain green coloring matter, or *Chlorophyle* must, it appears to me, in virtue of that fact, be regarded as of a vegetable nature. As to the others this point would be doubtful. The tailed Monads, forming the

genus *Bodo* (Ehr.) are the most interesting, from the fact of their having a long filamentous tail, which is their locomotive organ ; on this account, and because their form and presence are more constant than those of any other particles of this family, I have devoted considerable time to them.

Those which are found in the intestines of the common house fly, or in those of the frog, answer very well for studies of this kind. Those in the fly, when first seen, resemble in shape a kernel of rye. They are about $\frac{1}{2000}$ of an inch in length, and $\frac{1}{6000}$ in breadth. Attached to the body is a delicate hair-like tail, four or five times its length. By the addition of water the body becomes large by endosmosis, assuming a perfectly spherical shape, after passing through all the intermediate ones, so that, when magnified with the highest power of Spenser's microscope, it is nearly one inch in diameter ; permitting the most thorough and satisfactory study of their structure, which I find, after repeated observations, has no peculiarities except those belonging to cells. It is a closed cell-sac, with a filiform caudate process, and capable of the actions of cell-membranes, namely, endosmosis and exosmosis. In the interior of this sac are found sometimes a few granules, and sometimes a nucleus. In those of the frog, which are larger, I have seen distinctly in some a nucleus with a nucleolus, in others two nuclei, and in others still, four nuclei of equal size ; thus showing, that here the multiplication of cells, takes place as elsewhere, by segmentation of the nucleus. Aside from these characteristics, which are sufficient, the fact that I have sometimes met with them in the interior of epithelial cells, would be strongly presumptive of their cell-origin from minute granules that pass through the cell wall. The representatives of the genus *Bodo*, therefore, appear to be simple cells, each with a filiform appendage for locomotion, and which locomotion, therefore, can have *no* adaptive character.

There are differences in them, as they may be taken from different ocalities ; but because these particles are cells,

capable of much change of shape by contraction and dilatation, these differences can never serve as the basis of *Species;* which would also be true from the fact, that, having no individuality of their own, there is necessarily an absence of permanent type-characteristics.

Art. V. — *Notes and Observations on the Analysis and Character of the Soils of the Scioto Valley, Ohio, with some general Considerations respecting the Subject of Soil Analyses.* Read before the Boston Society of Natural History, March 3d, 1852. By David A. Wells.

In the spring of 1851, I was intrusted by the Secretary of the Ohio State Board of Agriculture, Prof. W. W. Mather, with the office of analyzing and reporting upon the soils of that State, and under his direction have executed a series of analyses of soils taken from Pike County, Scioto Valley. For the purpose of showing the character and chemical composition of these fertile soils, as well as, to some extent, the method adopted for their examination, I submit a few of the analyses above referred to.

The first analysis to which I would call attention is that of a soil taken from the East bank of the Scioto, in Pike County. This ground is occasionally overflowed, and has been cleared and cultivated for about eighteen years successively in corn, and yields, with ordinary culture, from seventy to eighty bushels per acre. The average crop has not sensibly diminished since it was first cleared. The timber growth originally on this ground when cleared, was honey-locust, black walnut, pawpaw, box elder, white ash, elm, mulberry, and buckeye.

The color of this soil when dry, was of a dark brown, or

black. Sample examined, of an extraordinary degree of fineness, and entirely free from stones or pebbles. Absorptive and retentive character for moisture, — 7.4170 grammes, dried at 212° F., absorbed up to point of saturation 4.5230 grm's water; making whole weight of soil and water = 11.9400 grammes. The above quantity of saturated soil exposed 24 hours, Therm. 60, to the open dry atmosphere, lost 2.3545 grm's moisture.

Continued exposure until weight ceased to vary, under the same circumstances, whole loss = 4.2485.

Thoroughly dried at 212°, additional loss = 0.2745; whole loss = 4.5230.

CHEMICAL ANALYSIS.

Water, hygrometric and combined,		= 03.636
Waxy and resinous matters extracted by alcohol,	.0030	
" " " ether,	.0025	
Total extract,	.0055	
Per centage of the whole amount,		= 00.0164

Constituents soluble in pure Water.

Extracts of earth; Alkaline chlorides, with traces of Lime,	= .0460	
Organic matter, Crenic Acid,	= .0208	
Silica, Iron, Lime, with traces of Sulphuric Acid,	= .0652	
Total water extract	= .1320	
Total per centage,		= 00.395

Constituents soluble in dilute Acid.

Iron, Alumina, and traces of Manganese,	= 01.995
Organic matter in combination with Iron, Alumina, &c.	= 1.004
Silica, soluble,	= 0.640
Phosphoric Acid,	= 0.041
Potassa and Soda,	= 0.161
Lime,	= 1.026
Magnesia,	= 0.236
Total per centage constituents soluble in acid,	5.103

Organic matter rendered soluble by Ammonia, accompanied with Alumina, and indicating the presence of Apocrenic Acid,	= 01.840
Do. do. by Soda,	= 04.368
Organic matter remaining in combination with the insoluble residue and determined by ignition,	= 04.145
Whole amount of organic matter found in the soil, as extracted by water, acid, and alkalies, and determined from final residue,	= 11.373
Whole amount as determined by ignition in a new portion of soil,	= 10.970
Difference,	= 00.403
Insoluble silicates and earthy residue,	= 78.842
100 parts of the insoluble residue gave by washing and separation, 45 parts silicious sand; 55 " clayey matter. Total, 100	
Total per centage upon the whole analysis,	= 98.3454

Another soil examined by me was taken from the Ree Ree Bottom, a district embraced in the Scioto Valley. This soil has been cultivated fifty-one years; forty-five crops of corn and two or three of wheat have been taken off from it; it has also been a few years in grass, or clover. It has scarcely diminished in fertility, and now with the most ordinary culture, yields on an average, one year with another, eighty bushels of corn to the acre.

This soil resembled the preceding in color, and possessed like it, a remarkable fineness of its elementary particles. Chemical analysis gave as follows: —

Water, hygrometric and combined,		= 3.500
Resinous and waxy matters extracted by alcohol,	= .032	
" " " ether,	= .004	
Total,		= 0.036

Constituents soluble in pure Water.

Extract of Earth, Alkaline Chlorides, etc.	= .032	
Organic matter, crenic acid,	= .010	
Iron, Lime, Silica, etc.	= .012	
Total per centage of the water extract,		= 0.190

Constituents soluble in dilute Acid.

Iron, Alumina, with traces of Manganese,	= 2.760
Organic matter combined with the above bases,	= 0.860
Silica,	= 0.560
Lime,	= 0.390
Magnesia,	= 0.280
Alkalies,	= 0.161
Phosphoric acid, traces,	
Total per centage of constituents soluble in dilute acid,	= 5.011

Organic matter rendered soluble by ammonia,	= 3.140
" " " soda,	= 1.030
Organic matter remaining in combination with the final residue, and determined by ignition,	= 1.720
Insoluble silicates,	= 83.010
This insoluble residue, by washing and separation, gave 59 parts silicious and 41 parts clayey matter.	
Whole amount of organic matter determined by acids and alkalies,	= 6.750
Total per centage of the analysis,	= 97.637

The third analysis which I submit is that of the subsoil underlying the fertile Ree Ree Bottom. This Bottom, at the first settlement of the country, was prairie. The soil in question was of an exceedingly coarse variety, and in color, light yellow, or buff. Chemical analysis gave for its constituents as follows: —

Water, hydroscopic and combined,	= 00.44
No appreciable quantity of waxy or resinous matter extracted by either alcohol or ether.	

Constituents soluble in Water.

Chloride of Potassium,	= .007	
Organic matter,	= .0055	
Silica and Lime traces,		
Total water extract,	.0125	
Per centage on the whole amount,		= 00.057

Constituents soluble in dilute Acid.

Iron, Alumina, and Manganese,	= 02.000
Organic matter combined with Iron,	
Alumina and Manganese,	= 00.440
Silica, soluble,	= 00.200
Lime,	= 2.55
Magnesia,	= 1.28
Traces of Phosphoric Acid not determined.	
Do. Alkalies " "	
Total per centage of extract with Acid,	= 6.470
Carbonic Acid,	= 02.30
Organic matter rendered soluble by Ammonia,	= 00.42
" " " Soda,	= 00.05
Organic matter remaining with the insoluble residue and determined by ignition,	= 00.50
Insoluble silicates,	= 90.27
Total,	= 100.507

Another soil analyzed was taken from an uncultivated portion of the Ree Ree Bottom. This land is set in grass, which has never been mowed, but is occasionally pastured. Chemical analysis gave the following results : —

Water, hygroscopic and combined,	= 01.56
Resinous and waxy matters extracted by alcohol,	= 00.0024
" " " ether,	= 00.0009
Total,	= 00.0033

Constituents soluble in pure Water.

Berzelius's extract of earth, Alkaline chlorides in the traces of Lime,	= 0.237	
Organic matter, principally Crenic Acid,	= 0.050	
Iron, Lime, with traces of Silica,	= 0.055	
Total water extract,	= 0.342	
Per centage,		= 00.111

Constituents soluble in dilute Acid.

Iron, Alumina, and traces of Manganese,	=	1.629
Organic matter combined with Iron, Alumina, &c.	=	0.550
Silica,	=	.628
Phosphoric Acid, (traces,)		
Lime,	=	.281
Magnesia,	=	.102
Alkalies, (traces,)		
Percentage on the whole amount acid extract,	=	3.190
Organic matter rendered soluble by Ammonia, Apocrenic Acid,	=	02.530
Organic matter rendered soluble by soda,	=	.610
Organic matter remaining with the insoluble silicates, and determined by ignition,	=	1.600
Insoluble silicates,	=	88.520
Total,		98.159

100 parts of the insoluble residue consisted of 70 parts silicious sand, with a few particles of feldspar and yellow jasper; 30 parts clayey matter.

Several points noticed during the examination of these soils of the Scioto Valley, Ohio, I consider as especially worthy of attention. Their great fertility is generally known, as well as their general character and chemical composition, but I am not aware that any extended and thorough examination of a suite of specimens from known localities has heretofore been made by any chemist.

The first and perhaps the most interesting fact noticed in the examination of these soils, is the remarkable degree of fineness of their constituent particles. In this respect, I venture to assert, that they are not surpassed by any other alluvial deposits upon the surface of the earth; some of the soils being little else than impalpable powders. In commencing their examination it was at once seen that a mechanical division of these soils, by means of the sieves ordinarily used in soil analyses, would not afford a fair indication of the minuteness of their particles. I therefore procured a sieve of the finest gauze, the largest meshes of which, by accurate

measurement, did not exceed one sixtieth of an inch in diameter. The soil was then broken in a porcelain mortar, care being taken that the dried particles only were crushed, without triturating any of the silicates, or earthy matter. One hundred parts of six samples of soil, representing a particular district, so treated, left upon the sieve before described the following small quantities of coarse residue; of which it should be stated, that it was made up in part of vegetable fibre and undecomposed organic matter. Of soil No. 1, seven parts in one hundred remained upon the sieve; of No. 2, one and six tenths; of No. 3, a subsoil, from twenty to thirty parts; of No. 4, six and three tenths; of No. 5, one and five tenths; of No. 6, eight parts in one hundred.

The remarkable comminution of the particles of these soils, gives us at once a clue to the secret of their great fertility. With this fineness, an increased power is at once given to a soil for the absorption, retention, and condensation of moisture, carbonic acid, and ammonia; an opportunity for the free permeation of atmospheric air; a facility to the rootlets of plants for extension, and a consequently increased facility for receiving and appropriating nourishment. Indeed a soil but scantily provided with the inorganic constituents deemed necessary for the support of vegetable life, but gifted with this fineness of the elementary particles, must possess great elements of fertility. In fact, I consider the existence of a large proportion of finely divided matter in a soil of almost as much importance, so far as regards its fertility, as its chemical constitution. It must be also evident that a soil composed in great part of silicious matter, (as many of the fertile western soils are,) may, if the particles possess sufficient fineness, assume to a considerable extent the good properties and character of an aluminous soil, without its bad ones. As an illustration of this, I would state, that one of the best tobacco soils upon the Island of Cuba, some time since examined by Dr. A. A. Hayes, of Boston, was found to contain ninety per cent. of the peroxide of iron. And yet this soil,

which we might suppose would be barren, without the usual proportions of silicious and aluminous matter, is, on account of its great fineness, and the remaining ten per cent. of organic and inorganic constituents, enabled to yield the best crops upon the Island.

These advantages derived from the fineness of the elementary particles, it is evident the Ohio soils will always possess, as it cannot be exhausted by any system of culture; and if due regard be paid to supplying them with sufficient quantities of organic and inorganic nutriment, they must and always will be unrivaled for fertility.

An examination of the silicious, insoluble constituents of these soils, leads to the belief, that they have not been derived from the disintegration or decay of any underlying, or contiguous rocks, but from materials brought from a distance. The rocks of Ohio are for the most part carbonate of lime; and yet in only one of the soils examined by me, namely, a subsoil, could the slightest trace of carbonic acid be detected. The method adopted for testing was by placing the soil in a favorable light upon a watch-glass, covering it with dilute warm acid and watching carefully for the appearance of effervescence. In this way the slightest trace of carbonic acid could not fail of being recognized. In the examination of the soils of Massachusetts by President Hitchcock, the same remarkable deficiency of carbonates, even in soils resting upon carbonate of lime rocks, was noticed. The same conclusions have also, I understand, been arrived at by Dr. D. D. Owen from an examination of the soils of Iowa and Wisconsin. From these facts, I am led to believe, that the alkaline and earthy carbonates are to a much greater extent wanting in arable soils than is generally supposed. This supposition may perhaps be restricted to the northern portions of this country, which have soils resulting mainly from materials distributed by the drift agency. Where a soil containing considerable quantities of organic matter is tested for carbonates after ignition, they will generally be found; the crenates and apocrenates

passing over into carbonates, and remaining fixed, except at a high temperature.

A microscopic examination of the insoluble silicious residues of these soils, left after the extraction of all soluble organic and inorganic matter, showed them to be composed of the detritus of syenitic and porphyritic rocks; consisting of minute particles of quartz, feldspar, and yellow jasper, without the presence of mica.

These conclusions I would not present as wholly conclusive respecting the origin of the soils of the Scioto. The quartz, feldspar, and jasper may have been immediately derived from the disintegration of the Waverly and other Ohio Sandstones, and the carbonates may have disappeared by the agency of plants, or by long continued draining and filtration. Yet the impression left from a careful examination was, that the present composition and character of Ohio soils is different from what it would have been had their mineral constituents been derived from the strata upon which they rest.

The quantity of organic matter in these soils is generally large, varying in the samples examined from two to ten per cent. It should be stated that the estimation of this organic matter was made upon the finest portion of the soil after sifting; and in this there is not included the smallest portion of undecomposed vegetable fibre, which is not unfrequently estimated in the organic percentage of other analyses, especially where equal care in sifting is not observed. The amount of nitrogenous compounds contained in this organic matter is undoubtedly large, although not determined. The peculiar odor of these products while burning, was noticed very appreciably in the ignition of some of the samples.

Particular attention was given to the accurate determination of the amount of waxy and resinous matters contained in these soils; and although it may not be possible to say, that they enter unaltered and directly into vegetable systems. yet we know that as constituents of vegetables they reënter to form fats in the systems of animals. I cannot, therefore, but

regard a soil analysis, into which their determination does not enter, as essentially deficient.

In the statement of the analyses, the products extracted by alcohol and ether, have been given separately. At present I am not prepared to say, that bodies of a different constitution are extracted by these different solvents. There are, however, reasons which induce me to believe this is really the fact, and also, that the products so extracted are not mere resins and gums, as is generally supposed, but vegetable fat acids. This subject, which is entirely new, has been also examined by Dr. A. A. Hayes, of Boston, who, I am happy to say, agrees with me in the opinions above expressed.

Among the constituents of these soils soluble in water, were found soluble organic matter, (to which Berzelius applies the term, "Extract of earth or mould," and Dr. Dana, of Lowell, "Solution of vegetable extract,") alkaline chlorides, lime, magnesia, iron, silica, and organic matter combined with these bases. The presence of the first three of these bodies was to be expected; but the solution of the last three in water, in the absence of a mineral acid, and that too in considerable quantities, seems to me especially worthy of attention. An explanation must be sought for in the presence of the organic matter, crenic or apocrenic acid. In the latest published works of Mulder, a salt of the constitution, $C^{48} H^{12} O^{24}$ (apocrenic acid) $+ NH^4O + KO + CaO + MgO + FeO$, is given as soluble in water. It is not improbable that the extractive matter noticed possessed this constitution.

Appreciable quantities of phosphoric acid and alkalies were found to exist in all the soils examined. The determination and separation of the first-mentioned agent in a soil, is a matter of such difficulty and uncertainty, that unless the result obtained has the entire confidence of the analyst, a statement of percentage had better be omitted. I think I hazard little in asserting, that the determinations of phosphoric acid, as given in a large majority of the soil analyses made in this country, have little or no value.

In these analyses, for the first time, has the amount of organic matter combined with the iron, alumina, and manganese been carefully estimated by itself. This organic matter is undoubtedly combined with the above-mentioned bases as an acid, and as such may have an important bearing upon the fertility of a soil. In some of the New England soils this acid has been ascertained by Dr. Hayes to be oxalic acid; and the soil, as might be expected, was adapted to the growth of sorrels and acid plants. I have tested the soils from Pike county carefully for oxalates, but have not been able to detect them. What other acid may be present I am unable to say; the subject in this connection is new and requires considerable investigation. It has heretofore been generally omitted in the analysis of soils.

Manganese was present in all the specimens examined. It appears to be present, accompanying iron in almost all soils, and very frequently in the waters of lakes, ponds, and rivers. Its quantitative determination, unless present in large quantities, as well as the separate estimation of the amount of iron, and the amount of alumina soluble in acid, I consider of no consequence in a soil analysis.

The method of extracting and determining the amount of organic matter contained in a soil by means of alkalies, seems to possess advantages over that of any other. The plan pursued in the analyses presented is essentially as follows:—All matters contained in the soil capable of solution in water or dilute acid having been removed, the portion remaining is digested in a small quantity of caustic ammonia; the matter rendered soluble is washed out, precipitated by an acid, dried at 250° F., and determined. The quantity thus obtained is considered as representing that portion of organic matter which is immediately available for the use or nourishment of plants. The same portion of soil is then digested in a stronger alkali, caustic soda, and treated as before. The product so obtained is considered as representing that portion of organic matter which is in a less advanced stage of decomposition;

not yet available for the support of the crop under ordinary circumstances, but which will be available at no distant period. Finally, after washing the soil with water and acids, and after treating it with caustic alkalies, a portion of organic matter still remains, unaltered and insoluble. This organic matter, usually the largest portion in a soil, is conceived to exist in a state allied to charcoal, or rather lignite, exercising no direct influence upon the plant, but of great value when not in too large excess for the absorption and retention of moisture, ammonia, and carbonic acid. In ordinary soil analyses the organic portion of a soil existing in these three several conditions, is estimated as a whole and without distinction, thus giving the agriculturalist no opportunity of judging whether this portion of his soil is in a condition resembling a peat-bog, or in a state conducive to fertility.

A comparison of the results obtained from the examination of these fertile soils from Ohio, with those obtained by others from an examination of the soils of New England, seems to show most conclusively to the agriculturalist of this district, the necessity for a thorough breaking and pulverizing of the earthy particles, and for the preparation, preservation, and proper application of organic manures, the produce of the farm-yard and the muck-bed. These conclusions are not new; they are the result of the experience of ages, and of the observations and experiments of every practical farmer. The tendency of the present day is to favor mineral manures. I would not undervalue them; but at the same time I wish that the old notions respecting thorough tillage and the value of the barnyard products, notions the value of which experience has taught, and which all scientific investigations are now confirming, may not be undervalued or underrated.

Art. XXI. — *On the Skeleton of the Great Chimpanzée, Troglodytes gorilla.* Read before the Boston Society of Natural History, April 21st, 1852. By S. Kneeland, Jr., M. D. Boston.

The Society has recently received a most valuable addition to its Cabinet, in a nearly complete skeleton of the Troglodytes gorilla, presented by the American Board of Commissioners for Foreign Missions. It consists of a fine skull, with lower jaw, with the teeth complete; all the vertebræ except the atlas; the pelvis complete; both scapulæ and clavicles; the entire humerus, radius, and ulna of left side, the ulna of the right side with the humerus and radius broken; the femur and tibia of right side, and the head and upper portion of shaft of the left femur; all the ribs, a few bones of the hand, and the manubrium of the sternum.

The cranium is of great size and strength; the internal capacity is only twenty-seven cubic inches, while that of another specimen belonging to the Society is thirty-five cubic inches. Prof. Wyman gave the measurement of the last as half an inch less; this trifling difference may be owing to my using smaller shot, and perhaps pressing them down a little more closely. From the capacity, from the great development of the sagittal and lateral crests, and the massive character of all the bones, this is undoubtedly a male; the appearance of the jaws, the complete development and worn surfaces of the teeth indicate an adult, if not an old animal. The sutures are hardly discernible, as usual; the superciliary ridges and crests are exceedingly well developed. The specific characters pointed out by Professor Agassiz, in the decreasing depth of the infra-orbitar canal from before backwards, and the projection outwardly of the inner walls of the orbits, are well seen on this specimen. There are two infra-orbitar foramina on each side. The nasal bones are united together, in the lower half presenting traces of a median suture, in the upper half a prominent ridge; the portion of the bone between the

inner orbitar angles of the frontals seems to confirm Dr. Wyman's opinion, that it is an independent piece, having its own centre of ossification; the foramen existing midway between the incisive foramen of each side and the edge of the alveolus, on the left side is replaced by two, as in the Chimpanzée. The zygomatic arches are exceedingly strong, much more so than in our other specimen, inclosing temporal muscles which might easily account for the tremendous strength of the jaws. The other anatomical peculiarities of the cranium and face have been sufficiently detailed by Dr. J. Wyman in the fifth volume of the Society's Journal, (p. 426.) The following points are interesting: — The dental formula is the same as in man; the median upper incisors are twice the size of the lateral, the reverse of which is the case in the lower jaw; they are also respectively longer, giving to the upper incisors a convex edge, and to the lower a concave one; in the upper jaw there is an interval of two or three lines between the incisors and canines, and no interval between the latter and the premolars, the reverse being the case in the lower jaw, in which, however, the interval is less; the upper canines extend from the alveolus one inch and a half, the part within the alveolus being at least two inches; they are an inch broad and three fourths of an inch thick; the upper canines are worn anteriorly by the lower, and posteriorly by the first lower prèmolar, giving to the tooth a triangular shape, with an anterior, a posterior, and an internal cutting edge; the action of the lower premolar on the upper canine, and of the latter on the lower canine, produces a distinct *talon*, or heel, at the base of these teeth; the two grooves, mentioned by Dr. Wyman as occurring on the inner face, are not seen in these canines, probably from the extent of the worn surface; there is the lower portion of a single groove, however, which is lost in the worn surface beyond. To produce these surfaces there must be some lateral motion of the jaw, which would not be expected from the great length of these teeth. The premolars and molars agree with Owen's description in

the Cyclopedia of Anatomy and Physiology (Art. Teeth); in the upper molars the anterior inner cusp is seen to be united to the posterior outer cusp by an oblique ridge; the first lower premolar is much larger than the second, the anterior cusp being so strongly developed that the tooth resembles an enlarged human canine; all the lower molars have three cusps on the outside and two on the inside. The lower jaw, as will be seen by the measurements, is of great size and strength; the ramus being at right angles with the body of the bone; the condyle is one inch and three fourths wide, and five eighths of an inch thick, projecting much internally; the coronoid process is higher than the condyle. The external face of the ramus is deeply concave for the masseter muscle, which is nearly three inches wide; the ramus inclines very much outwardly at its lower portion, and is grooved internally for the internal pterygoid muscle. The body of the jaw is one and three fourths inches high, and nearly an inch thick; the height at the symphysis, and width is two inches; the thickness one and one fourth inches; the chin is convex and retreating, its convexity measuring three and one fourth inches.

Trunk. Of the vertebræ, only the atlas is wanting. The odontoid process of the axis, instead of being almost perpendicular as in man, inclines backwards at an angle of about 50°; the spinous process is an inch long, spreading at its apex to nearly the same width, with an evident disposition to fork as in the human type; it is also somewhat concave at the end of its under surface. The bodies of all the *cervical* vertebræ are higher, but narrower than in man, and received deeply one in the other. The spinous processes are horizontal, long, and, excepting the third, which is sharp-pointed, are swelled or club-shaped at the end; the fourth is the longest, the third the shortest; their lengths are, from the posterior face of the spinal canal, as follows: — the third, two and one eighth inches; the fourth, three and three fourths inches; the fifth, three and five eighths inches; the sixth,

three and one eighth inches; the seventh, three and one fourth inches. The use of these long spinous processes is sufficiently obvious, being required for the attachment of the ligamentum nuchæ, which must be very strong in these creatures; from the posterior situation of the occipital foramen, the head must have a great tendency to fall forward, and its immense weight requires a corresponding strength in this ligament. The transverse processes are very long, the posterior an inch in length; the anterior, or cervical ribs, begin to be seen at the fourth, increasing to the sixth and seventh, which last are of equal size; there being, as a general rule, no cervical ribs to the seventh vertebra of the mammal neck. All the cervical vertebræ are pierced for the vertebral artery on each side; the transverse processes are directed obliquely downwards.

The *dorsal* vertebræ are *fourteen* in number, (as in the Chimpanzée, according to Cuvier); they much resemble the human in shape and size; the last two are rather larger, and more like the human lumbar vertebræ; the spinous and transverse processes are much more developed; the spinous process of the first is like the cervical, and two and seven eighths inches long; the spinal canal is less in this and the remainder of the column; the spinous processes of the second and third dorsals are compressed laterally at the end, and are two and a half inches long. At the fourth, the spinous processes begin to descend, as in man, to the ninth; below this they resemble the lumbar spines, though pointing more downwards. The last dorsal has its rib on the right side firmly anchylosed to the body.

The *lumbar* vertebræ are only *three* in number, fewer than in any of the higher Mammals; the bodies are larger and thicker than in man; the vertical diameter is less anteriorly than posteriorly, making this region concave anteriorly, and showing that the erect position is as unnatural for it as for the other Quadrumana. Possibly one of the lumbar vertebræ may be missing; though from the manner in which they fit into each other, and into the last dorsal and first sacral, it seems hardly

probable; adding the fourteen dorsals, the whole number is the same as in man.

The *sacrum*, which has a slight lateral deviation to the left, consists of *eight* bones, firmly joined together, the intervertebral spaces being obliterated, excepting between the first and second. The first bone resembles very much a lumbar vertebra, and on one side its transverse process, though bearing the upper portion of the articulating surface for the right ilium, is not connected with the lateral portion of the sacral wing below; on the left side, the bony union is complete, and the spinous process is continuous without interruption or foramen with the median sacral crest; this crest, at its upper portion, is two inches in height, gradually decreasing, and lost entirely on the sixth bone, where also the sacral canal terminates. The sacrum is long and narrow, having a very decided concavity anteriorly. The articulating surface for the ilium is confined to the first three vertebræ. Whether or not any coccygeal vertebræ are anchylosed in the sacrum, it is not easy to say; from the uncommonly large number of sacral vertebræ, namely, eight, it would seem probable that these also include the coccyx; the terminal bone ends in a rounded projection, which has somewhat the appearance of an articulating surface.[1]

The bodies of the second and third cervical vertebræ incline backwards; the direction becomes perpendicular in the fourth, and in the last three a little inclined forwards; at the upper dorsal region the spine is slightly convex, in the lower dorsals and lumbar concave; at the last lumbar and first sacral it is again convex, and in the lowest portion again concave. The whole number of vertebræ is thirty-two, and possibly thirty-three; the length of the cervical, dorsal, and lumbar vertebræ is twenty-two inches; from this it would appear that the spinal column is very nearly as long as the

[1] In Dr. W. Lewis's description of a Gibbon (Vol. I. of this Journal, p. 35.) it is stated that the coccyx consisted of one bone; in our specimen this single rudimentary coccyx may have been attached to the sacral terminal surface.

human, to which it also comes nearer, in its curves, than to that of any of the Quadrumana.

The *pelvis* of the *T. gorilla* departs widely from that of the Chimpanzée and Orang, and approaches that of man in the greater spread of the ilium, — its deep anterior cavity, and corresponding posterior convexity, on which a well-marked longitudinal ridge indicates the origin of the glutæus maximus, — and a fainter semicircular line, extending from the sciatic notch to near the rudimentary anterior inferior spinous process, about two and a half inches above the acetabulum, the probable origin of the glutæus minimus; the anterior superior spinous processes are fully six inches in advance of the plane of the sacrum. The sacrum extends only to the spine of the ischium, about four inches from the tuberosities of this bone, so that the pelvis has somewhat of the lengthened narrow form peculiar to the Quadrumana, though it projects far more from the line of the spine than in the other members of the group. The superior aperture has not the narrow, elongated shape of the Orang's, the antero-posterior diameter being only half an inch greater than the transverse, these being respectively six and a half and six inches; in the female, according to Dr. Wyman's measurements, the difference is greater, being three inches. The tuberosities of the ischia are very thick and broad, and the rami of the pubes very wide; the whole lower portion indicates great strength and solidity. It is the portion of the pelvis between the acetabulum and the lower edge of the sacro-iliac articulation, which is so much shorter in this animal than in the Chimpanzée, and which gives to the pelvis its more human aspect.

At first sight the *scapula* has the appearance of the human, having very much its shape, but somewhat enlarged; the measurements given at the end of the article show it to have belonged to a larger specimen than the one described by Dr. Wyman. It more nearly resembles that of the Orang than that of the Chimpanzée, but is more like that of Man

than either, in its more equilateral form. The spine is placed nearly in the middle of the bone, making the supra spinous nearly equal to the infra spinous fossa; after about one third of its length it ceases to have the broad thick edge of the human spine, reaching nearly to the posterior border, but is continued by a sharp well-marked ridge quite to the edge, as in the Orang; the spine is also more perpendicular to the plane of the dorsum than in man, and its direction more that of the axis of the trunk. The acromion process is longer, and less curved than in man, and wants the strong angle on its posterior surface a little in advance of the plane of the glenoid cavity; its arch over this cavity belongs also to a much larger circle. The coracoid process has a greater inclination downwards than in man and the Chimpanzée; this direction, in the Orang, Vrolik considers a sign of inferiority. The glenoid cavity is much the same as in man, the upper half being less narrow in proportion. The subscapular fossa is very deep, and divided by prominent ridges into five or six smaller depressions. There is no deep supra-scapular notch as in the human scapula; but there is a decided concavity at the base of the coracoid process, without the narrowness of a notch, contrasting strongly with the nearly straight line of the upper border of the bone in the Orang.

The *clavicles* are shorter and stronger than in man, and less curved; the edges are more angular; their length, in a straight line, is six and one fourth inches; their circumference in the middle two inches, thence increasing to each end; the subclavian ridge is well marked.

The *sternum*, at its upper portion, is four inches wide, and about half an inch thick; there is a decided semilunar notch, but less than in man; the lower portions are wanting. There is no sign of division into lateral halves in this upper portion, which is three and three fourths inches long. The articular surface for the clavicles is less curved and more horizontal than in man.

The *ribs* are fourteen pairs; of these two are wanting on

the left side, at about the middle of the series. They much resemble those of man, and form a very capacious thorax; they are, however, longer and thicker, and the curves less complicated. Some of them, like other bones, bear marks of old injuries. The angles of the ribs are extremely well marked; even the last is united both to the body and to the transverse process of a single vertebra.

The *humerus* is about three inches longer than that of man, and two inches greater in circumference at the middle, the latter measurement being five inches; around the middle of the head, horizontally, eight and one fourth inches; greatest width at lower extremity four and one fourth inches. The bone is of very compact structure, and very heavy. It resembles that of man, but it is less twisted on itself; the bicipital groove is quite deep and wide, having on its sides very large tuberosities for the insertion of the powerful muscles indicated by the immense scapular surface of origin; the ridges for the attachment of the pectoralis major, latissimus dorsi, and teres major attest also the great strength of these muscles; unlike those of Dr. Wyman's specimen, these bones have the deltoid insertion well marked, and the anterior face rather convex than concave, even more so than in man. Both the condyles, and the condyloid ridges are more developed than in man; the trochlear portion is less excavated, and the internal ridge less prominent; there is a deep groove between the trochlea and the surface for the head of the radius, which is very slight in man. The lower extremity is perforated in the right humeris, but not in the left; the cavity for the olecranon is an inch in width and half an inch deep, while that for the coronoid process on the anterior surface is hardly sunk beneath the level of the bone; this difference is much less in man.

The *ulna* is more curved than in man, as is also the *radius;* they curve in opposite directions, inclosing a wide space between them; the curve of the radius begins at the tubercle, while the ulna is curved its whole length. The articulating

surface for the humerus, on account of the less prominence of the inner ridge of the trochlea, differs from that of man in being proportionally wider, and in having a deep concave inner wall, which in the human ulna is not only wanting, but the edge of this border of the joint is worn into a deep notch corresponding with the long inner ridge of the human trochlea; at the bottom of this cavity is an irregular long bone, apparently wedged in, and perhaps having a separate centre of ossification; if the olecranon process were taken off through the suture here left open, the head of the ulna would very much resemble the head of the tibia, to which it corresponds in the lower extremity; this is seen on both sides. The articulating surface for the head of the radius is less perpendicular than in man; the coronoid process is also less prominent, in conformity with the small anterior concavity on the humerus; the styloid process, and the accompanying groove, occupy a greater proportion of the lower extremity. With the exception of stronger ridges, and sharper angles, the remaining portions of the ulna and radius resemble much the same bones in man, on a large scale. The proportion between the humerus and ulna brings this animal nearer to man than the Chimpanzée or Orang.

The *femur*, in its head and neck, is much like the human; it has a roughness, hardly a depression, for the ligamentum teres; the neck of the bone is proportionally shorter, and placed more obliquely with respect to the shaft; the trochanters, especially the great, are much stronger; the lesser trochanter also stands out enormously to receive the internal iliac muscle, situated in the immense iliac fossa, and principally concerned in flexing the thigh on the pelvis, as in the act of climbing; the space between the great trochanter and the head of the bone is less, and the concavity much deeper than in man; the neck of the bone is also more flattened and less round, supporting, as it does, less proportional weight. The whole bone is flatter, especially just above the condyles, and its shaft more curved. Though the inner condyle is so

much longer than the external as to give the lower part of the shaft an inclination outwards, as in man, the curve of the middle and upper portions restores its general direction nearly to the vertical, as in the Chimpanzée. The femur is about two inches shorter than the humerus; in this respect the *T. gorilla* recedes from the human type, while he approaches it in the relative lengths of the ulna and humerus.

The *tibia* also is considerably shorter than the human, and more curved both laterally and anteriorly, producing consequently a large interosseous space. The upper articulating surfaces, as observed by Dr. Wyman, are on different planes; the internal one being the lowest and concave, the outer one convex; as the lowest surface answers to the longest condyle of the femur, the axes of the bones are nearly in the same line. The right *astragalus* is preserved, somewhat resembling the human, but flatter and longer; the articular surface for the tibia is less convex, and narrower posteriorly; the surface for the scaphoid is more prominent, flatter, and with a better-marked constricted portion or neck; the lateral surface for the tibia is more quadrilateral and less vertical; the surface for the fibula is less triangular; the posterior portion is wider, with a less deep groove for the flexor longus pollicis; the surfaces for the os calcis, with the deep groove, are very much as in man. There are also some carpal, metacarpal, and phalangeal bones of the hand, and a few phalanges of the toes; the metacarpal bones are long and curved inwards, with large lower articulating surfaces; the bones of the fingers have their edges much turned under on the anterior surface, for the protection of the vessels, nerves, and tendons, as they grasp the limbs of trees in their usual swinging mode of progression; they may also serve for the insertion of the strong ligaments.

All the bones are exceedingly solid and heavy, indicating very great muscular force; many of them bear marks of fracture and bony growths, which indicate that this was a veteran male, who had seen many a hard fight; the skull, the lower

jaw, and many of the long bones show by their broken condition that he was killed only after a severe struggle, and with many a wound both from bullet and cutting instrument.

The height of this specimen must have been nearly five and a half feet, and the breadth of his shoulders, judging from the scapulæ and ribs, over two feet; the hands extend a little below the knees; the abdomen, judging from the iliac fossæ, must be nearly two feet wide; the lower extremities are strongly bowed. If we clothe this immense skeleton with its powerful muscles and its coarse hairy covering, we may have an idea of a monster which it would be more pleasant to read about and describe than to meet.

A table of measurements (in inches) has been added, comparing this specimen with those of Dr. Wyman; those belonging to the former occupying the first column, and the latter the other two.

	Male.	Male.	Female.
Head.			
From the posterior plane of the occiput to margin of incisors,	13.5	12.	9.1
Greatest lateral diameter of cranium at post-auditory ridges,	6.	6.1	5.2
Smallest lateral diameter of cranium behind orbits	2.5	2.5	2.5
Diameter of face across zygomata,	6.75	6.5	5.5
Diameter of face outside of orbits,	5.3	4.9	4.3.
From posterior plane of occiput to fronto-nasal suture,	7.5	7.3	6.5
From fronto-nasal suture to margin of incisors,	6.5	4.8	4.5
Breadth of zygomatic fossa,	2.	1.7	1.4
Inter-orbitar space,	1.3	1.1	1.
Lateral diameter of orbit,	1.6	1.5	1.4
Vertical diameter of orbit,	1.75	1.6	1.4
Length of bony palate,	3.5	3.7	3.4
Lower Jaw.			
Length from condyle to symphysis,	7.5	7.	6.5
Length from angle to symphysis, (outside,)	6.		
From angle to condyle,	5.		
Breadth between angles, (inside,)	5.		
Breadth of ramus,	2.9	2.9	2.45
Height of ramus,	5.	4.6	4.3
Upper Extremity.			
Length of scapula along base,	10.	9.	
Broadest part of scapula,	7.25	6.5	

	Male.	Male.	Female.
Posterior extremity of spine from upper angle,	5.3	4.5	
Humerus, ...	16.5	17.	
Radius, ...	13.5	13.5	
Ulna, ...	14.3	14.2	
Pelvis.			
Length of sacrum, ...	6.5	6.	
Breadth of sacrum, ...	4.	3.7	3.2
Breadth of pelvis between spinous processes of ilia,	16.5	15.	15.
Breadth of ilium, ...	9.	8.	7.5
Length of os innominatum, ...	14.5	14.	12.
Antero-posterior diameter of pelvis . .	6.5		8.
Transverse diameter of pelvis, . . .	6.		5.1
Length of symphysis, ...	3.2	3.	2.3
Long diameter of obturator foramen, . .	2.2	2.1	2.2
Outside of one tuber ischii to the other . .	7.15		5.8
Lower Extremity.			
Femur, ...	14.3	14.	
Tibia, ...	11.5	11.5	
Vertebræ. Last Dorsal.			
Transverse diameter, ...	1.7		1.75
Antero-posterior diameter, ...	1.25		1.
Vertical diameter of anterior face, . . .	1.1		.8
" " posterior face, . .	1.15		
Second Lumbar.			
Antero-posterior diameter, ...	1.3		1.15
Transverse diameter, ...	2.		1.7
Vertical " anterior face, . .	1.		1.
" " posterior face, . .	1.4		1.
Second Dorsal.			
Antero-posterior diameter, ...	.65		
Transverse diameter, ...	1.		
Vertical " anterior face, . .	.6		
" " posterior face, . .	.75		
Fourth Cervical.			
Antero-posterior diameter, ...	.7		
Transverse diameter, ...	.8		

Art. XXII. — *A Monograph of the Species of Pisidium, found in the United States of North America, with Figures.* By Temple Prime.

In the preparation of this Monograph, I have taken pains to obtain specimens of the different species from the original describers, and thanks to kind assistance have mostly been successful, as also to compare specimens from different localities.

In the description of the shells I have generally adhered to the text of the author, and have altered it but where I considered it absolutely necessary.

The figures are all magnified twice, with the exception of those of the *P. ventricosum*, *P. ferrugineum*, *P. rotundatum*, and *P. Kurtzii*, which are magnified four times.

PISIDIUM *Pfeiffer.*

Synonymy.

Concha Linn. *Tellina* Linn. *Cardium* Poli. *Chama* Geoffroy. *Musculus fluviatilis* Lister. *Pectrunculus fluviatilis* Lister. *Sphærium* Scopoli. *Cornea* Megerle. *Pisum* Megerle. *Corneocyclas* Ferussac. *Pera* Leach. *Englesia* Leach. *Gallileja* da Costa. *Physemoda* Rafinesque.

Under what family this genus ought to be placed has as yet not been decidedly settled by naturalists. Pfeiffer and Held place it among the Cardiums; La Marck and Philippi among the Conques fluviatiles, and Nilsson, Menke, Kleberg, Sowerby, Gray and Des Hayes alongside of the Cyclas and Cyrenas.

Pfeiffer is undoubtedly the first who separated this genus from Cyclas, but owing to his confounding the posterior and anterior extremities of the shells in his description, his remarks have not been as clear as they might have been.

The Rev. Mr. Jenyns of England, in his Monograph of the British Cyclas and Pisidium, accompanied not only by magnified figures of the shells, but also of the animals, was the first to place the subject in its true light.

As yet this genus has been but little or not at all acknowledged in this country. In Europe, Des Hayes himself in his notes to La Marck's Invertebrata, does not consider it as sufficiently distinct from Cyclas to constitute a genus; in his work, however, on Conchology applied to Geology, he has not only given it full justice but has thoroughly worked it up.

Some naturalists, and especially Gray, persist in applying to it the name of Pisum Megerle. Notwithstanding that, Megerle's type of the genus Pisum, the C. rivicola, is a genuine Cyclas.

Characters.

Animal. Lobes of the mantle without tentacles, united posteriorly into a short, single, syphonal tube. Oral aperture small, tentacles of the mouth triangular, elongated. Gills of medium size, unequal, united behind the foot. Foot small, triangular, capable of great extension.

Shell. Small, beaks terminal, suboval. Cardinal teeth terminal, small, two in the left valve, at times united into one. Lateral teeth longitudinal, compressed, lamelliform, double in the right valve.

The differences between Pisidium and Cyclas are very material both in the animal and in the shell. As may be seen by the above description, the animal of Pisidium has the edges of the mantle united into one single syphonal tube, whereas in Cyclas the edges of the mantle are united into one syphonal tube, also single at its base, but double at the extremities.

"The foot of Pisidium is widely different from that of Cyclas; it is somewhat similar to that of Cardium. This organ is capable of great extension, and when prolonged to

its utmost extent, it has much the appearance of the foot of the Lucinas. The animals make use of it in much the same manner, as do the Cyclas, either to dig a pit and bury themselves, or else to crawl on solid bodies." Des Hayes.

With regard to the shell, the principal difference consists in the position of the beaks. In Pisidium, the beaks are terminal, that is, the distance from the beaks to the anterior margin, is greater than the distance from the beaks to the posterior margin. In Cyclas, on the contrary, the position of the beaks is generally more or less central, dividing the hinge margin into equal portions. Considering the hinge, we find the characters very much the same, but the position of the cardinal teeth in Pisidium, like that of the beaks, is terminal and in Cyclas central.

The habits and modes of living of the animals of these two genera are very much the same. They seem to live either buried an inch or two below the water in the mud, or else attached to roots and leaves of aquatic plants.

Their mode of breeding is also the same, both ejecting the young from them, when sufficiently mature, which up to that time they carry between the folds of the gills. Pfeiffer supposes the Pisidium to breed by means of eggs, but I have myself found the young in the shells of Pisidium, in *P. variabile, P. Kurtzii,* for instance.

The most appropriate time of the year for collecting Pisidium, seems to be from the middle of April to the first of July, the breeding season; some species, however, such as the *P. variabile,* I have found at all seasons of the year, the winter inclusive, and others, such as the *P. ventricosum,* are seldom found but in the early summer. Live specimens, for examination, may easily be preserved for some time in jars or vases, and, on the occasional application of fresh water, they exhibit great activity, extending their syphonal tube and foot, not only in mounting the sides of the vase, but also in crawling on the under surface of the water. They are very similar in all their movements to Gasteropods.

DESCRIPTION OF THE SPECIES.

1. PISIDIUM VARIABILE *Nobis.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 7, 8, 9.

Pisidium variabile NOBIS. Bost. S. N. H. Proc. iv. 163.

DESCRIPTION. *Animal.* Foot rather short and thick, issuing from the immediate inferior opening of the mantle. Syphon short.

Shell stout and heavy, very oblique, rather inflated than otherwise; posterior subtruncate; beaks large, prominent, not approximate; margins rather abrupt; striations very heavy and irregular; color dark olive green with a zone of yellow on the margins; interior blue; hinge margin gently curved; cardinal teeth united, small; lateral teeth prominent.

Dimensions. Long. 0.21; lat. 0.18; diam. 0.179 inches.

GEOGRAPHICAL DISTRIBUTION. Portland, Me. (Mighels.) Cambridge Meadows. Rowley, Essex County, Mass. (Nobis.) New Hampshire, (Steele.) Manhattan Island, N. Y. (Nobis.) Lake Champlain and Lake George, (Nobis.) Greenwich, Washington County, N. Y. (Ingolls.) Connecticut, (Linsley.) Groton, Mass. (Lewis.) Virginia, (Anthony.)

OBSERVATIONS. This species has hitherto always been looked upon by collectors as the *P. dubium* Gould, but having compared it with the original shells, described as Cyclas dubia Say by Dr. Gould, in his Report, and with some specimens of *P. dubium* from Westfield, Mass. sent to me by Prof. C. B. Adams, as well as with some others sent to me from Philadelphia, by Prof. S. S. Haldeman, I have come to the conclusion that it is different from Say's shell. Compared to the young of *P. dubium* it is more oblique, less elongated, more inflated, and of a different color. This species is not so elongated as the *P. dubium*; it is more

inflated; the beaks are larger and more tumid; it is also a much smaller shell. Say describes the *Cyclas dubia* as being six twentieths of an inch in length; the *P. variabile* is only four twentieths of an inch in length; and that it is a full-grown shell, I am led to believe not only from its heavy striations and mature appearance in general, but also from having found young in the shell. The young is not so oblique as the adult; it is more elongated, less inflated, and of a light yellow color. As a general rule, the coloring of this species varies much in different localities. The specimens collected from Rowley, Essex County, Mass. are larger than any I have seen from other places; their color is also lighter. The animal is remarkable for its sluggishness and want of activity. This is one of our most common New England species, being found in nearly every stream, and at all seasons of the year, though most plentifully during the spring.

2. Pisidium Adamsii *Nobis.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 1, 2, 3.

Cyclas nitida Adams et Mighels. Bost. Journ. Nat. Hist. iv. 39, pl. 4, p. 3.

Pisidium Adamsii Nobis. Stimpson, N. Engl. Moll. 16. *(P. nitidum preoc.)*

Description. Shell subovate, full, solid, oblique; margins moderately rounded; beaks small, tumid; surface smooth, lines of growth light, deeper towards the margins; color light gray, with a zone of reddish yellow extending round the outline of the margins; in some cases the zone is wanting and the shell is of a uniform gray; interior whitish; hinge

margin curved. Cardinal teeth double, situated nearly in the centre; anterior tooth the larger, broader, and more elevated. Lateral teeth well visible and strong.

Dimensions. Long. 0.3; lat. 0.24; diam. 0.2 inches.

Geographical distribution. Norway, Oxford County. Maine. (Adams and Mighels.)

Observations. Compared to the *P. variabile* Nobis, this species is less oblique, slightly more elongated, less heavily striated, and of a different color; the whole shell is larger and stronger. Compared to the *P. dubium* Gould, it is shorter, more inflated; the beaks are more tumid; the color of both the exterior and interior is different; the hinge margin is less curved, and the teeth are not as well developed.

"The embryo shell is elliptical, obliquely striate, compressed." (Adams.) Found but rarely; it lives in running waters in company with *P. variabile*, *P. ventricosum*, etc. In Maine, Dr. Mighels has observed it with *C. partumia.* The so-called *C. nitida*, from Connecticut and New Hampshire, is the *P. variabile* Nobis.

3. Pisidium altile *Anthony.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 10, 11, 12.

Cyclas altilis Anthony. Adam's Catalogue, 1847, 29.
Pisidium altile Anthony, MSS.

Description. Shell small, ovate, oblique, angular, nearly equilateral; inferior margin rounded; posterior and anterior margins abrupt; beaks not large, but ovate and tumid, widely

separate; surface polished; lines of growth regular, visible; color dark olive-brown, shade lighter on the margins and on the beaks; interior light blue; hinge margin very angular; cardinal teeth small, separate; lateral teeth prominent.

Dimensions. Long. 0.07; lat. 0.07; diam. 0.09 inches.

Geographical distribution. Canandaigua Lake, N. Y. (Nobis.) Miami Canal, near Cincinnati, Ohio, (Anthony.)

Observations. This shell, by its oblique and wedge-like form, is entirely different from any other known species. Compared to the *P. dubium*, it is less elongated; the inferior margin is shorter, and the beaks are more tumid. Compared to the *P. Adamsii* it is more oblique, smaller and less full. The *P. variabile* is more inflated and larger.

Found in company with the *P. regulare* Nobis. It seems to bury itself in the mud.

4. Pisidium dubium *Gould.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 4, 5, 6.

Cyclas dubia Say; Nichol, Encyclo, Amer. Edit. iv. pl. 1, fig. 10; Gould's Report, 75, fig. 56; De Kay, 293, pl. 25, fig. 261.
Pisidium abruptum Haldeman; Proc. Ac. Nat. Sci. 1, 53.
Pisidium dubium Gould. Agassiz's Lake Superior, 245.

Description. "Shell rather thick, triangular, with its corners rounded; beaks at one end very little elevated; base and longer side regularly rounded; valves tumid; surface with minute concentric wrinkles, which towards the base enlarge with obvious folds; color a light olive with darker zones and a marginal border of yellowish; within bluish or greenish." (Gould's Report, 75.)

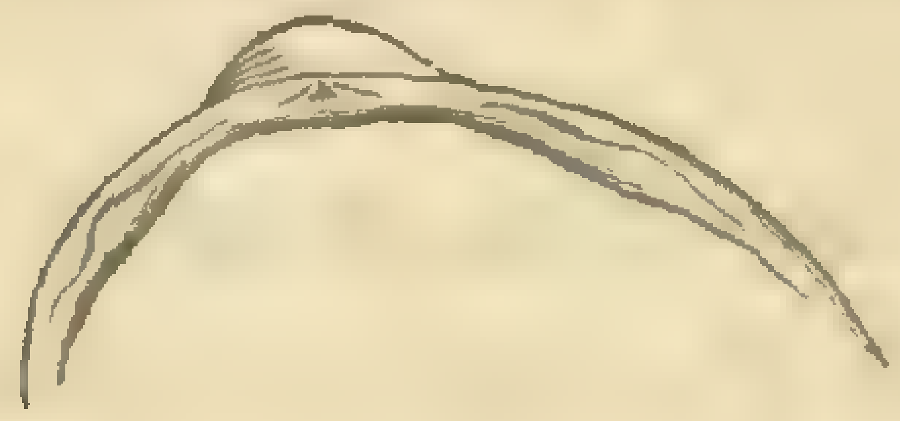
Hinge margin very much curved. Cardinal teeth situated posteriorly, double, small; anterior tooth the larger; lateral teeth larger, acute.

Dimensions. Long. 0.35; lat. 0.29; diam. 0.21 inches.

Geographical distribution. Berkshire County; Westfield, Hampden County, Massachusetts. (Gould and Adams.) Connecticut, (Linsley.) Herkimer and Wayne Counties, New York, (Newcomb.) Delaware River, (Say.) New Jersey, (Richards.) Elk River, Cecil County, Maryland. (Haldeman.) Baltimore, Maryland, (Foreman.) Ohio, (Jay's Catalogue.) Lake Saratoga and Lake Champlain, (Nobis.) Troy, N. Y. (Newcomb.) Pittsfield, Mass. (Shurtleff.) Greenwich, Washington County, N. Y. (Nobis.) Schuylerville, on Hudson River, (Ingolls.) Wisconsin, (Anthony.)

Observations. This, our largest American species, is remarkable for the resemblance it bears to the *P. amnicum* of Jenyns, a European shell. The foreign shell is however larger, more elongated and less oblique; the teeth are less prominent and not so strong. The young shell is much more elongated than the adult, and is of a pale white.

Found plentifully in ponds and ditches.



5. Pisidium ventricosum *Nobis.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 16, 17, 18.

Pisidium ventricosum Nobis, Bost. S. N. H. Proc. iv. 68.

Description. Shell small, globose, tumid, rather oblique; margins abrupt; striations regular and light; beaks very ter-

minal, large, prominent, not approximate; color reddish white when the animal is alive, but otherwise of a light transparent yellow; hinge margin irregular; cardinal teeth separate, of about the same size; lateral teeth separate, acute, prominent.

Dimensions. Long. 0.11; lat. 0.095; diam. 0.085 inches.

GEOGRAPHICAL DISTRIBUTION. Cambridge Meadows, and Rowley, Essex County, Mass. (Nobis.) Pittsfield, Mass. (Shurtleff.)

OBSERVATIONS. This remarkable species, owing to its globose form, is not likely to be confounded with any other but the *P. rotundatum.* The latter shell, however, is less oblique, the margins are more rounded, the beaks are more central, larger, and more rounded. Found very plentifully during the spring and early summer; at other times of the year I have never been able to find it. It lives in running waters in company with *P. variabile* and *P. compressum.*

6. PISIDIUM COMPRESSUM *Nobis.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 13, 14, 15.

Pisidium compressum NOBIS. Bost. S. N. H. Proc. iv. 164; Annals of the New York Lyceum of N. H., N. 219, pl. 6.

DESCRIPTION. *Animal.* Foot very long, narrow, issuing from the inferior opening of the mantle; syphon short.

Shell rather small, oblique, triangular, tumid, ovate in adult, compressed in young, heavily striated in adult, less so in young; color varying from yellow, gray, and brown, with a zone of yellow on the margins, occasionally spotted on the beaks; beaks small, very prominent, very distant; hinge

margin angular; cardinal teeth situated centrally, double, small; lateral teeth elongated.

Dimensions. Long. 0.16; lat. 0.14; diam. 0.9 inches.

Geographical distribution. Cambridge Meadows, Mass. (Stimpson.) Augusta, Me. (Nobis.) Connecticut River, Mass. (Nobis.) Groton, Mass. (Lewis.) Lake Champlain, Lake Saratoga, (Nobis.) Greenwich, Washington County, N. Y. (Nobis.) Herkimer County, N. Y. (Lewis.)

Observations. This species bears much resemblance to the *P. altile* Anthony. It is, however, more inflated, less oblique, less tumid; the beaks are smaller, the apex of the shell is not so elevated, the longitudinal length is greater, and the hinge margin is not quite so angular. Compared to the *P. variabile*, it is less inflated, smaller, more oblique, and of a different color.

The animal is remarkable for its liveliness. Found sparingly during the spring, and not at all in winter. It inhabits both running and still water, and buries itself somewhat in the mud.

7. Pisidium rotundatum *Nobis.*

Cabinet of the B. S. N. H.
Pl. XI. Fig. 19, 20, 21.

Pisidium rotundatum Nobis. Bost. S. N. H. Proc. iv. 164.

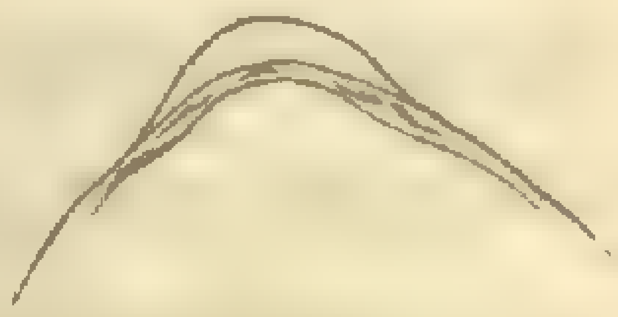
Description. Shell small, globose, ventricose, tumid; anterior and inferior margins rounded; posterior margins somewhat abrupt; beaks very large, prominent, rounded, approximate, very little removed from the centre; surface glossy; striations very light; color yellow, darker on the

beaks; hinge margin much rounded; cardinal teeth united; lateral teeth elongated.

Dimensions. Long. 0.095; lat. 0.075; diam. 0.08 inches.

GEOGRAPHICAL DISTRIBUTION. Lake Superior, (Agassiz.)

OBSERVATIONS. This minute species bears some resemblance to the *P. ventricosum*, but it is less inflated, more equilateral; the margins are more rounded, and the beaks are larger and more prominent.



8. PISIDIUM TENELLUM *Gould.*

Cabinet of the B. S. N. H.

Pl. XI. Fig. 21, 22, 23.

Pisidium tenellum GOULD. Agassiz's Lake Superior, 246.
Pisidium rubellum NOBIS. Bost. S. N. H. Proc. iv. 163.

DESCRIPTION. Shell small, fragile, subglobose; margins well rounded; beaks full, well rounded, and approximate, not tumid; striations not heavy; color light yellow; young shell more inflated and shorter than adult; hinge margin gently curved; teeth all very rudimentary.

Dimensions. Long. 0.07; lat. 0.14; diam. 0.10 inches.

GEOGRAPHICAL DISTRIBUTION. Lake Superior, (Agassiz.)

OBSERVATIONS. Compared to the *P. minus*, this species is more full, the outline is more circular and less elongated; the beaks are not so tumid, and the whole shell is smaller. In outline it is somewhat similar to the *P. abditum*, but the teeth are totally different, as also the coloring.

9. Pisidium obscurum *Nobis.*

Cabinet of Professor Adams of Amherst.

Pisidium obscurum, Nobis. Bost. S. N. H. Proc. iv. 161.

Description. Shell large, delicate, somewhat globose, elongated; inferior margin well rounded; anterior and posterior margins less so; beaks situated very near the posterior extremity, large, tumid, not approximate; surface smooth and polished; striations hardly visible; color dark olive green, lighter on the beaks, with a broad zone of yellow on the margins; interior light blue.

Dimensions. Long. 0.26; lat. 0.20; diam. 0.15 inches.

Geographical distribution. Ohio, (Adams.)

Observations. In outline this species is very similar to the *P. minus*, but otherwise it is different; it is more inflated; the beaks are more prominent, the color is different, and the shell is larger.

10. Pisidium abditum *Haldeman.*

Cabinet of the Academy of Natural Sciences.

Pl. XI. Fig. 24, 25. Pl. XII. Fig. 1.

Pisidium abditum Haldeman. Proc. Ac. Nat. Sci. 1, 53.

Description. Shell small, ovate, ventricose, somewhat tumid; margins well rounded; beaks not much removed from the centre, somewhat elevated and approximate; surface smooth, lines of growth light; color light with a broad zone of yellow round the margins; hinge margin rounded; cardinal teeth small, separate; anterior tooth the larger and more prominent; lateral teeth small, acute; teeth all strong.

Dimensions. Long. 0.15 ; lat. 0.14 ; diam. 0.09 inches.

Geographical distribution. Columbia, Lancaster County, Pennsylvania, (Haldeman.)

Observations. This species seems to be very closely allied to the *P. minus* ; on comparison, however, it is found to be more ventricose, longer in latitude, and shorter in longitude ; the beaks are more terminal, the marginal outline is more rounded, the color is different, and it is on the whole a smaller shell.

Compared to the *P. dubium*, it is more elongated, less oblique, less heavily striated, much smaller, and of a different color Owing to its habits of burying itself in the ground a foot or more, it is generally covered with a coating of light mud. Found plentifully.

11. Pisidium minus *Stimpson.*

Cabinet of the B. S. N. H.

Pl. XII. Fig. 5, 6, 7.

Cyclas minor. Adams and Mighels. Bost. Jour. Nat. Hist. IV. 39, pl. iv. fig. 2.

Pisidium minus. Stimpson. Stimp. N. Engl. Moll. 16.

Description. Shell ovate, elongated, fragile ; margins well rounded, somewhat oblique, very finely striated ; beaks prominent, two fifths of the distance from one extremity to the other ; umbones and discs tumid ; posterior and hinge margins slightly rounded ; color uniform light yellow ; cardinal teeth small, united ; lateral teeth well developed.

Dimensions. Long. 0.15 ; lat, 0.15 ; diam. 0.11 inches.

Geographical distribution. Portland and Monmouth, Me. (Adams and Mighels.) Augusta, Me. (Nobis.) Wey-

bridge, Vt. (Adams.) Cambridge, Mass., (Stimpson.) Groton, Mass. (Lewis.) Conn. (Linsley.) Manhattan Island, N. Y. (Nobis.) Lake George and Canandaigua Lake, N. Y. (Nobis.) Herkimer, N. Y. (Lewis.)

Observations. Compared to the *P. dubium*, this species is less oblique, transversely shorter; the margins are more rounded, the striations are less heavy, the color is different, and the whole shell is smaller and more delicate. Its foreign analogue is the *P. australe* of Pfeiffer.

This shell was discovered by Dr. Mighels and Prof. Adams, among some dead leaves in a swamp near Weybridge, Vt. It lives in swamps, and buries itself in the mud. Prof. Adams has observed its occurrence under stones. I have frequently found it in running streams in company with *P. variabile* and *P. compressum*. The animal is very lively.

12. Pisidium Kurtzii *Nobis.*

Cabinet of the B. S. N. H.

Pl. XII. Fig. 5, 6, 7.

Pisidium Kurtzii Nobis. Bost. S. N. H. Proc. iv. 162.

Description. Shell very small, subovate, rather equilateral; margins rounded; beaks but very little removed from the centre, large, obtuse at the summit, approximate; striations very fine; color pale yellow; hinge margin rather straight; teeth rudimentary.

Dimensions. Long. 0.12; lat. 0.09; diam. 0.075 inches.

Geographical distribution. Charleston, S. C. (Kurtz.)

Observations. This species is without doubt the smallest

known in the country. That it is not an immature shell, I have satisfied myself from having found the young within it. Compared to the *P. minus,* it not only differs in size but also in being more equilateral, and having the beaks obtuse on the summits. Compared to the *P. tenellum,* it is less globose, more equilateral, and the beaks are neither so swollen nor as rounded.

13. Pisidium ferrugineum *Nobis.*

Cabinet of the B. S. N. H.

Pl. XII. Fig. 8, 9, 10.

Pisidium ferrugineum Nobis. Bost. S. N. H. Proc. iv. 162.

Description. *Animal.* Foot very long and narrow, issuing from the anterior extremity of the shell. Syphon extremely short.

Shell small, ovate, somewhat globose; margins well rounded, somewhat equilateral; beaks very small, but tumid, very distant; surface smooth, lines of growth minute, but regular and well visible; color pale yellow; hinge margin curved; cardinal teeth large, separate; anterior tooth the more prominent; lateral teeth prominent.

Dimensions. Long. 0.17; lat. 0.13; diam. 0.11 inches.

Geographical distribution. Cambridge Meadows, Mass. (Stimpson.) Rowley, Essex County, Mass. (Nobis.) Groton, Mass. (Lewis.) Herkimer County, N. Y. (Lewis.)

Observations. This species is remarkable for the elevation of its beaks, which stand forth on its back like tubercles or excrescences. It differs from *P. minus,* in being smaller, more convex, and not so elongated, as also in being more equilateral. The beaks are generally covered with some dark ferrugineous substance. The foreign analogue is the

P. Henslowanum Jenyns. This is one of our most common shells, and it lives most generally in company with *P. variabile* and *P. ventricosum.* Found generally at the roots of aquatic plants.

14. Pisidium regulare *Nobis.*

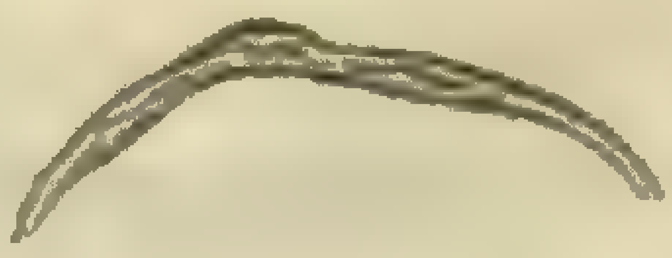
Cabinet of the B. S. N. H.
Pl. XII. Fig. 11, 12, 13.

Description. Shell compressed, somewhat elongated, tumid, rather oblique; inferior margin rounded; anterior margin abrupt; posterior margin rather sharp; beaks neither large nor tumid, approximate; striations visible; color olive green, with a broad zone of yellow on the margins; interior whitish blue; hinge margin rounded; cardinal teeth very large, widely separate, of about an equal size; lateral teeth well developed.

Dimensions. Long. 0.21; lat. 0.15; diam. 0.11 inches.

Geographical distribution. Miami Canal, near Cincinnati, Ohio, (Anthony.)

Observations. Compared to the *P. variabile*, this species is less inflated, the beaks are smaller and less tumid, the whole shell is more slight, and is moreover rendered distinct by its tapering form; the teeth are also more developed. Compared to the *P. minus*, it is less elongated; the outline of the margins is less rounded, and the coloring is different. Found in company with the *P. altile*, and like that species, it seems to bury itself in the mud.



15. Pisidium arcuatum *Nobis.* (Fossil.)

Cabinet of the B. S. N. H.

Pl. XIII. Fig. 14, 15, 16.

Description. Shell small, rather elongated, somewhat depressed; anterior margin somewhat angular; other margins well rounded; beaks terminal, not tumid, well rounded, approximate; lines of growth numerous, rather coarse, epidermis light; color deadish yellow; hinge margin nearly on a straight line; cardinal teeth small, double; lateral teeth formed by the projection of the anterior cardinal tooth.

Dimensions. Long. 0.15; lat. 0.19; diam. 0.11 inches.

Geographical distribution. Brattleborough, Vt. (Ingolls.)

Observations. This species somewhat resembles the *P. variabile*, but it is less inflated, less oblique, and the beaks are not as prominent. The specimens that I have seen retained, most of them, their epidermis; and in some the enamel of the interior was still visible. Found by Dr. Ingolls in company with two fossil species of Cyclas, which appear likewise to be new.

16. Pisidium zonatum *Nobis.*

Cabinet of the B. S. N. H.

Pl. XII. Fig. 17, 18, 19.

Pisidium zonatum Nobis. Bost. S. N. H. Proc. iv. 162.

Description. Shell large, moderately inflated, transparent, somewhat elongated; margins all well rounded; beaks large, not prominent, well rounded, approximate; lines of

growth very fine; color pale yellow with zones of yellow; hinge margin very rounded; teeth rudimentary.

Dimensions. Long. 0.22; lat. 0.18; diam. 0.13 inches.

Geographical distribution. Greenwich, Washington County, N. Y. (Ingolls.)

Observations. The outline of this shell is very like that of the *P. obscurum*, perhaps anteriorly rather more rounded. Compared to the *P. minus*, is less elongated, broader and much larger. It differs from the *P. Adamsii* in being less inflated, as also less oblique.

17. Pisidium notatum *Nobis.*

Cabinet of the B. S. N. H.
Pl. XII. Fig. 20, 21, 22.

Description. Shell small, fragile, not pellucid, inflated, somewhat elongated; margins generally well rounded, not approximate; lines of growth regular, not prominent; shell ornamented with prominent ridges rising from the inferior margin upwards; in some cases the ridges are very regular, there being from three to four on each valve, and the same distance seems to be preserved between each one; in other cases, however, there is neither regularity nor symmetry, and the number and the size of the ridges being very variable; color light brown, at times ornamented with a broad zone of yellow on the inferior margin; hinge margin rounded; teeth slight; cardinal teeth single; the anterior lateral tooth visibly more prominent than the posterior lateral tooth.

Dimensions. Long. 0.19; lat. 0.16; diam. 0.12 inches.

Geographical distribution. Greenwich, Washington County, N. Y. (Ingolls.)

Observations. This is a truly remarkable species, and, owing to its ridges or sulcations, is not likely to be confounded with any other. Compared to the *P. abditum*, the outline is less spherical and more elongated. Compared to the *P. minus*, it is more inflated, less elongated, broader, and not only more sulcated but also larger.

18. Pisidium equilaterale *Nobis.*

Cabinet of the B. S. N. H.

Pl. XII. Fig. 23, 24, 25.

Description. Shell small, stout, heavy, somewhat inflated, rhomboidal; margins of very nearly the same length; posterior margin abrupt; inferior and anterior margins slightly rounded; beaks large, very prominent, rounded, not approximate; color varying from a light brown to a yellowish brown; in some cases there is a zone of light yellow on the inferior margin, and in others there are two or three zones; lines of growth very fine. The epidermis is in some specimens glossy; hinge margin lightly curved; cardinal teeth small, lateral teeth rudimentary.

Dimensions. Long. 0.15; lat. 0.14; diam. 0.10 inches.

Geographical distribution. Augusta, Me. (Nobis.) Groton, Mass. (Lewis.) Hudson River, (Ingolls.) Herkimer County, N. Y. (Lewis.)

Observations. This shell is remarkable for its short and quadrangular form, giving it somewhat the appearance of a Cyclas. Compared to the *P. variabile* it not only differs in not being oblique, but also in size. Found in the Spring

of the year by myself in a clay-pit near Augusta, Me. in company with the *P. compressum.*

19. Pisidium equale *Rafinesque.*

Cabinet of C. A. Poulson, Esq. of Philadelphia.

Physemoda equale Rafinesque. Bivalves of the Ohio, taken from the Annal. Génér. des Sci. Phys.

Dimensions. Long. 0.80; lat. 0.25; diam. 0.53 inches.

Observations. Owing to there being no figure attending Rafinesque's description of this shell, and never having seen the original specimens, I have not been able to identify it to my satisfaction.

LIST OF THE KNOWN SPECIES OF PISIDIUM, AND THEIR SYNONYMY.

1	abditum,	Haldeman,	N. America,	Proc. Ac. Nat. Sci. 1, 53.
	abruptum,	Haldeman,	N. America,	Proc. A. N. S. 1, 53, is *P. dubium.*
2	acutum,	Pfeiffer,	Europe,	Pf. Moll. de l'Allem.
3	Adamsii,	Prime,	N. America,	Stimp. N. E. Moll. *Cyclas nitida.*
4	altile,	Anthony,	N. America,	Mss. *Cyclas altilis.*
5	amnicum,	Jenyns,	Europe,	Jenyns Monog. *Cyclas amnica.*
	appendiculatum,	Leach,	Europe,	Turton's Man. is *P. Henslowanum.*
6	arcuatum,	Prime,	N. America,	Prime, Monog. (fossil.)
7	Australe,	Pfeiffer,	Europe,	*Cyclas australis.*
8	casertanum,	Poli,	Europe,	Villa's Cat. 1841.
9	cinereum,	Alder,	Europe,	Alder's Suppl. Cat. 4. *C. cinerea.*
10	compressum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 164.
	diaphanum,	Haldeman,	S. America,	Pr. A. N. S. 1, 53. is *C. diaphana.*
11	dubium,	Gould,	N. America,	Agassiz's L. Sup. 245. *C. dubia.*
12	duplicatum,	Pfeiffer,	Europe,	Pf. Moll. de l'Allem. [*equale.*
13	equale,	Rafinesque,	N. America.	Rafin. Bivalve of the Ohio. *Phys.*
14	equilaterale,	Prime,	N. America,	Prime, Monog.
15	ferrugineum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 162.
	fontinale,	Pfeiffer,	Europe,	is *P. pulchellum.*
16	Gassiesianum,	Dupuy,	Europe,	Gassies, Cat. 1849.
17	Henslowanum,	Jenyns,	Europe,	Jenyns, Monog. *C. appendiculata.*
	inflatum,	Megerle,	Europe,	Porro, Malac. is *P. Pfeifferi.*
	Jenynsii,	Gray,	Europe,	Turton's Man. is *P. pulchellum.*
	Johannis,	McGillivray,	Europe,	McGilliv. Moll. of Scot. is *P. pulch.*
18	Kurtzii,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 162.
19	limosum,	Gassies,	Europe,	Gassies, Cat. 1849.

20 **minimum,**	**Studeman,**	**Europe,**	
21 minus,	Stimpson,	N. America,	Stimp. N. E. Moll. *Cyclas minor.*
22 nitidum,	Jenyns,	Europe.	Jenyns, Monog. *Cyclas nitida.*
23 notatum,	Prime,	N. America,	Prime, Monog.
24 **Normandianum,**	**Dupuy,**	**Europe,**	**Gassies, Cat. 1849.**
25 nucleolus,	Moricand,	Europe.	Mss. [*cum.*
obliquum,	Pfeiffer,	Europe,	Pf. Syst. Accord. 125. is *P. amni-*
26 obtusale.	Pfeiffer,	Europe,	Pf. Syst. Accord. 125. *C. obtusalis.*
27 obscurum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 161.
palustre,	**Nilsson,**	**Europe,**	**is *P. amnicum.***
28 Pfeifferi,	Ziegler,	Europe,	Porro Malac. *P. inflatum.*
29 pulchellum.	Jenyns,	Europe,	Jenyns, Monog. *Cyclas fontinalis.*
30 pusillum,	Jenyns,	Europe,	Jenyns, Monog. *Cyclas pusilla.*
31 roseum,	Scholtz,	Europe,	Scholtz, Cat. 1848.
32 **regulare,**	**Prime,**	**N. America,**	Mss.
33 rotundatum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 164. [*lum.*
rubellum,	Prime,	N. America,	B. S. N. H. Pr. iv. 163. is *P. tenel-*
34 semen,	Menke,	New Holland,	Menk. Moll. Nov. Holl. 40.
35 supinum,	Schmidt,	Europe,	Zeitschrift f. Malac. 1850.
36 tenellum,	Gould,	N. America,	Agassiz, L. Sup. 245. *P. rubellum.*
37 variabile,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 163.
38 ventricosum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 68.
39 zonatum,	Prime,	N. America,	Bost. S. N. H. Proc. iv. 162.

I am much indebted in the compilation of this list to the excellent Conchological Library of John C. Jay, M. D. of Rye, Westchester county, N. Y. There are, therefore, as may be seen by the above enumeration, thirty-nine known and identified species of Pisidium, to which number I add three more fossil species, from Germany, which are mentioned in the Monograph of the Wealden of Northern Germany; their names, however, I do not know. Nineteen of these species, one fossil and the rest living, are found in the United States, one species is found in New Holland and the rest are natives of Europe.

Of the American species, three, the *P. Adamsii*, *P. ferrugineum*, *P. ventricosum*, are found but in New England; one, the *P. dubium* is found from Massachusetts, as far South as Maryland, and as far west as Wisconsin; five, the *P. equilaterale*, *P. minus*, *P. compressum*, *P. variabile*, and *P. zonatum*, are found in New England and in New York; one, the *P. altile* is found in New York and in Ohio. The remaining American species have as yet been noticed only in the localities where they were first discovered.

I will add, that I am preparing a Monograph of the species of Cyclas found in the United States, and that any information on the subject is courted and will be thankfully received.

ART. XXIII. — *Description (with figure) of Menobranchus punctatus.* By LEWIS R. GIBBES, M. D., Prof. Math. Coll. Charleston, S. C.

AT the meeting of the American Association, at Charleston, in March, 1850, specimens and drawings of this species were exhibited, and a short notice of it given, (page 159 of Proceedings.) Of the ten individuals that had been obtained at that date, one was dissected by myself, and one by Dr. St. Julien Ravenel, one was accidentally lost, and the remainder preserved in alcohol. The examination of all the organs was not completed during the dissections, but the hope of obtaining additional specimens has not since been realized, and I am induced to offer the results of the examination, incomplete as they are, without further delaying the promised publication.

FORM AND DIMENSIONS. *Head*, sub-conic, flattened above and below, somewhat truncate at the snout; from tip of snout to cervical fold, measured along mesial line, 0.70 of an inch; from snout to branchial openings, 1.05 of an inch; from snout to attachment of forelegs, 1.50 of an inch. *Body*, subcylindrical, flattened above, with a slight furrow marking the course of the spine; from insertion of anterior limbs to that of posterior limbs, 2.70 of an inch. *Tail*, flattened, vertical, rounded, thin, and translucent at tip, bordered on the upper and under edges and tip with a continuous membranous expansion; from insertion of hind legs to tip of tail, 2.50 of an inch. Whole length, 6.70 of an inch. *Limbs*, four, short, slender, about three quarters of an inch in length, each with four toes.

INTEGUMENTS. Dark olive color above, diminishing in intensity on the sides of body and tail, and disappearing beneath, where pale flesh color prevails. Mesial line above somewhat darker than surrounding parts; mesial line below marked by a light stripe nearly white, running from neck to

vent. The dark color is produced by a multitude of dark minute dots (of a chocolate color as seen through a lens) closely set on a flesh-colored ground; numerous larger irregularly shaped orange-colored dots, formed by the agglomeration of several smaller ones, distributed at intervals over the whole upper surface from snout to tip of tail, and also on the sides of the body and lateral surfaces of the tail, diminishing in number on sides and under surface of the body, and disappearing towards middle of under side. At yet more distant intervals over the dark portions of the skin are large ill-defined dots of a darker color than the surrounding surface. The muciparous glands appear tolerably distinct, of a pale color, and the skin, in drying, leaves depressions where they exist. A dark line runs from the snout through the eye, dividing the iris, which is white, into an upper and lower segment. The neck is marked by a cutaneous fold, curvilinear, with the convexity forwards, running round to the branchiæ on each side. The upper and under surfaces of the limbs agree in color and markings with the corresponding surfaces of the body.

Digestive system. *Lips* thick, fleshy, movable, the upper most so in consequence of mobility of maxilla; the lower enclosed by the upper when the mouth is shut, the folding over most marked at the commissure, which extends nearly half way to the cervical fold. *Nostrils* on the anterior edge of the upper lip, at the angles of the somewhat truncate snout. *Teeth* all conic, white, with rufous tips; upper ones in two series, maxillary and palatine; maxillary about seven on each side, palatine about ten, the series extending to the commissure of the lips; lower teeth in a single series, about the same in number and extent as the palatine row of upper teeth. *Tongue* white, thick, fleshy, free at tip and sides, not pedicellate, not extensible. *Œsophagus* large, diameter nearly continuous with that of the stomach. *Stomach* when moderately inflated was 0.28 of an inch in breadth

at largest diameter, and tapered to 0.06 of an inch at pyloric orifice, which was situated about midway between the fore and hind legs. *Intestine* about 0.10 of an inch in diameter, receives the gall-duct at half an inch distance from pyloric orifice, and continues to the vent with little variation in diameter, and with two or at most three short convolutions. The whole length of alimentary canal, from commencement of œsophagus to the vent, is about six inches. *Vent* longitudinal, half to three fourths of an inch behind the insertion of the hind legs. The *spleen* 0.28 of an inch in length and 0.06 in breadth, lies behind the stomach and a little to the left. The *pancreas* 0.50 of an inch long, and 0.12 broad, sends its duct to enter the intestine just below the pyloric orifice. *Liver* dark brown, longitudinal, occupying the middle line of the body, presenting itself on opening the body, and concealing the stomach, intestines, and great blood-vessels beneath, the lungs being visible on each side. Its length is two inches, extending from a point between the insertion of the fore legs to a point at about two thirds the distance from fore to hind legs; its two lobes are separated by a superficial fissure. The *gall-bladder* is 0.25 of an inch long, about 0.60 of an inch from posterior extremity of liver, and its duct enters the intestine, as alréady said, about half an inch from pyloric orifice. Dr. St. Julien Ravenel, in his examination, observed that the mucous membrane of the stomach, and of what may by analogy be called the small intestine, was thrown into longitudinal folds; he also observed the relations of the spleen and pancreas, and the value of the presence of the latter.

Respiratory and Circulatory Systems. *Branchial tufts* three on each side, each supported by a cartilage, leaving two openings between the three cartilages; the anterior of the three cartilages on each side appears externally just at the lateral termination of the cervical fold. *Lungs* two, one on each side, cylindrical, with thin transparent parietes, resembling the air-bladder of fishes, with vessels ramifying through their thick-

ness; they terminate posteriorly in conical tips, and anteriorly open by a common trachea into the œsophagus; when inflated about 0.16 of an inch in diameter, and two inches in length; of the same longitudinal extent as the liver. *Heart* 0.16 of an inch in length, ovoid, situated anteriorly to the fore legs, in a position about midway between the anterior part of the cervical fold and a line joining the attachments of the fore legs. *Blood corpuscles* with diameters in the ratio of about five to four, the longer about 0.002 of an inch; nucleus about half those dimensions. Dr. Ravenel communicated the following observations. The branchial artery arises from the ventricle by a single trunk having a *bulbus aorticus*, and divides into two branches to supply the branchiæ on each side; it is worthy of remark, that no trunk of the branchial artery runs to the lungs, these being supplied from the aorta. The parietes and septa of the lungs are furnished with striated muscular fibre or voluntary muscles, as is the case in all animals where the branchiæ and lungs coexist.

Skeleton. *Cranium* with the bones united. *Spinal column*, with tail included, consisting of thirty-six vertebræ, the twenty-second being the last lumbar, and the twenty-third the first of the fourteen caudal vertebræ. Posterior extremities in some cases abnormally attached; in the individual dissected by Dr. Ravenel the right ilium was attached to the nineteenth vertebra, and the left to the twentieth; in the one dissected by myself the left ilium was attached to the nineteenth, and the right to the twentieth; and in a third individual, preserved in alcohol, which was partially dissected to examine this point, both ilia were attached to the nineteenth vertebra. *Scapulæ* cartilaginous throughout nearly the whole extent, and attached opposite the third vertebra. No vestiges of *ribs*. Superior *maxilla* movable.

Remarks. The first individual obtained was discovered by Mr. Augustus Shoolbred, on the plantation of his father, Dr. Shoolbred, on the South Santee River, S. C., a few miles

from its mouth, in February, 1848. Mr. Shoolbred was on the watch for animals of this tribe at my request, and rescuing this one from the hands of the negroes, who have a superstitious dread of the *Siren lacertina* and its congeners, secured it and sent it to me. The "piggin," or wooden vessel, in which the animal was placed after its capture, was destroyed by the negro to whom it belonged, who was resolved never to carry food in it or eat out of it again. This first discovered individual was unfortunately, but undesignedly, thrown away by one of my servants, to my regret. Soon after, however, at the request of Mr. Shoolbred, two more were sent to me from the same neighborhood by Dr. Alexander Gadsden, and after the lapse of a week or two, five more were transmitted to me by Dr. Shoolbred. None were obtained in 1849. In the spring of 1850, two more were sent me by Dr. Shoolbred, but none could be obtained for me in the two following years, so that ten only have been seen. They were all discovered in cleaning out ricefield ditches, which is done once a year, at the close of winter. Several of these animals were kept alive for some months in a basin of water, by supplying fresh water every day or two. When calm, the branchial tufts were most beautifully displayed on each side of the neck, of a bright vermilion color; but when alarmed, or disturbed, the branchiæ lost their brilliant tint, and, in a state evidently more flaccid than before, lay closer to the sides of the neck. Occasionally rising to the surface of the water they would open their mouths and take in a bubble of air, which was immediately after passed out beneath the surface of the water with a sound as of a faint squeak, the only approach to voice that was perceived. A granular deposit was observed in the basin after the lapse of a day or two, but its origin and source were not ascertained. After existing in captivity for some months, apparently in good health and activity, each individual suddenly declined in strength, became sluggish, unable to preserve the normal position in the water, and in a few days died.

Charleston, S. C., Jan. 17, 1853.

ART. XXIV. — *Descriptions of Shells from the Gulf of California and the Pacific Coasts of Mexico and California.* By AUGUSTUS A. GOULD, M. D.

DURING the recent war with Mexico, several valuable collections of shells were made by officers of the navy and army engaged on the Pacific coast of Mexico and California, and along the Gulf of California. Three of these have been submitted to me for examination. They were made by Col. E. Jewett and Maj. William Rich, of the army, and Lieut. Thomas P. Green, of the navy. The coast visited extended from Panama, 8° 49′ N. to San Francisco, about 37° 20′ N.; and the other principal localities explored were, on the Mexican coast, Acapulco, Mazatlan, San José, and Guaymas, (28° N.); La Paz, about 24° 30′ N. and San Juan, 27° N. on the west coast of the Gulf; and San Pedro, San Diego, Santa Barbara, and Monterey, on the California coast. The number of species from Col. Jewett was about 225; from Maj. Rich, 130; from Lieut. Green, 200; in all, perhaps, 400 species; and as they were collected alive by the gentlemen themselves, and their localities carefully noted at the time, they become very valuable when considered in the light of geographical distribution. It would be interesting to publish the whole list; and perhaps this may be done at some future period. It has already been done so far as respects those species which were found at Panama, and at other places in common with Panama, by the late Prof. C. B. Adams, in his very interesting work on the shells of Panama. Several very curious facts derived from a comparison of these Pacific species with the shells of the Gulf of Mexico might here be stated; but it is our present purpose to give descriptions and figures of the new species, so far as the prescribed limits of the paper will admit. Brief characters of some of

them have already been given in the Proceedings of the Society for November, 1851; they are here amplified and mostly accompanied with figures.

BULIMUS VESICALIS (Pl. XIV. Fig. 1.)

Testa tenuis, lactea, ovoidea, striatula, vix perforata; spira brevis, anfractibus $5\frac{1}{2}$, ultimo elliptico quadrantes tres longitudinis testæ adequante: apertura dimidiam long. adequans, lunata; labro simplici; columellâ reflexâ.

Shell ovoid, thin, milk white, delicately and regularly striate; spire short, whorls $5\frac{1}{2}$, inflated, the last one more than three fourths the length of the shell, nearly symmetrical in form at both extremities; aperture somewhat more than half the length of the shell, narrow lunate; lip simple; columella broadly reflected over a narrow umbilical fissure; a thin glazing of callus on left lip.

Length an inch and a fourth; breadth seven tenths of an inch.

Inhabits Lower California. *Maj. Rich.*

Form and size of *B. apodemetes*, D'Orb., which has variegated colors, a broader base and larger aperture. It is somewhat like *B. coturnix*, and more especially like *B. oblatus* Gould.

BULIMUS VEGETUS (Pl. XIV. Fig. 2.)

T. solidula, elongato-ovata, alba, striatula, perforata; spira elevata, anfract. sex, (suturâ impressâ) ultimo dimidiam longitudinis testæ superante, tumido, subgibboso; apertura subovata; labio subcontinuo, reflexo, faucibus stramineis.

Shell rather solid, elongate ovate, white, faintly striate; spire acuminate; whorls six, convex, suture well impressed, last whorl three fourths the length of the shell, tumid and somewhat gibbous on the back; aperture placed somewhat laterally, half the length of the shell, suboval, its plane nearly that of the axis, extremities of the lip approximate; lip moderately reflexed at base, still less so laterally, rising broadly at the columella, and standing off from the body whorl; umbilical opening large and deep, subcircular; fauces cream colored.

Length an inch and a half; breadth nearly one inch.

Inhabits San Juan, Gulf of California. *Lieut. Green.*

Belongs to the group with *B. sordidus.* Its form is like that of

B. rhodolarynx, which, however, has a more circular aperture and different coloration.

BULIMUS EXCELSUS (Plate XIV. Fig. 3.)

T. elongato-ovata, acuminata, solidiuscula, lævis, fulvida, albido strigata; spira elevata, peracuta, anfr. septem ultimo trientes duos long. vix æquante: apertura trientem long. adequans, subovata; labro albo anticè revoluto, subcontinuo, ad columellam expanso, fissuram latam obtegente.

Shell ovate-fusiform, rather solid, smooth, pale coffee colored, with unequal longitudinal strigæ of white shading into each other, white at suture; spire acute, elongated; whorls seven, moderately convex, the last not quite two thirds the length of the shell; aperture less than half the length of the shell, obliquely subovate, lip soon becoming revolute, broadly so in front, rising, a little narrowed, by a somewhat abrupt curve upon the columella, and expanding again as it rises, until the two extremities of the lip nearly meet; the columellar portion stands off from the body whorl, displaying a large umbilical fissure; lip white, with a brown submargin at the point of reflection.

Length $1\frac{3}{4}$ inch; breadth $\frac{3}{4}$ inch.

Inhabits California. *Maj. Rich.*

This shell has very much the appearance of *B. Lobbii*, Reeve, from Peru; but the aperture is larger and differently proportioned; the colors are less bright, the stripes broader and more blended. *B. pallidior*, Sowb., has the aperture more like it, but is colorless, and has the spire less elongated. In form it is also much like *B. xanthostoma*, D'Orb. It has the form of *B. membranaceus*, but is much larger and thicker.

ACMÆA PALEACEA (Pl. XIV. Fig. 5.)

T. parva, tenuis, elongata, lateraliter valde compressa et triangularis, ad dorsum utroque costis obtusis ornata; apice acuto propè trientem anteriorem longitudinis sito; color straminea, vel cinnamomea.

Shell minute, delicate, thin, elongated, laterally compressed, so that the two sides are parallel; dorsal aspect a long, narrow oval; lateral aspect low triangular; apex at about the anterior third, acute, antrorse; surface with delicate lines of growth, and a few

obtuse radiating ridges along the dorsal slope at each end: color straw yellow, or cinnamon brown.

Length $\frac{1}{4}$ inch; height $\frac{1}{10}$ inch; breadth $\frac{1}{16}$ inch.

On kelp or stems of Zoophytes, Santa Barbara. *Col. Jewett.*

This curious little shell can be compared with no other species, unless it be *A. alveus*, which is still comparatively much broader. It has much the size and shape of a glume of wheat.

CREPIDULA EXPLANATA (Pl. XIV. Fig. 7.)

T. unguiformis, elongata, calcarea, apice terminali; anticè angustata, truncata, denticulo mediano armata; marginibus ex lamellis disjunctis alveolatis; dorso concavo; intus porcellana, lateribus incurvatis; septum dimidiam long. testæ metiens, valdè arcuatum, margine concavo.

Shell unguiform, long and gradually narrowing, incurved, apex acute, terminal and median; tip truncate, with a denticle at the middle; sides apparently having a portion clipped off, presenting the edges of the lamellæ of growth which have been separated from each other so as to give a cancellate appearance; the edges are thus thickened and raised, so that the back of the shell is a concave trough. Exterior, dead white. Interior, polished porcelain white, the edges very slightly incurved, scarcely forming a cavity. Septum extending nearly half the length of the shell, remarkably arched, its free edge slightly concave.

Length $1\frac{1}{4}$ inch; breadth $\frac{1}{2}$ inch; height $\frac{1}{3}$ inch.

Inhabits Monterey. *Lieut. Green.* Lower California. *Maj. Rich.*

A very curious shell, which, from its structure, must have resided in tubes of some sort, perhaps those made by Pholas. Its most remarkable characters are the loose and cancellate structure of its edges, the truncate and dentate tip, and the excavated back as if made by a gouge.

BULLA (AKERA) CULCITELLA (Pl. XIV. Fig. 8.)

T. subcylindracea, solidula, albida, spiraliter concinnè striata, epidermide stramineo induta; anfr. quinque, ultimo elongato subfusiformi, anticè rotundato, supernis spiram conicam efformantibus; sutura profundè canaliculata: apertura linearis, antrorsum dilatata; columella valdè contorta, uniplicata; labro posticè sensim recedente.

Shell ovoid-cylindrical, rather solid, bluish white, covered by a rough straw colored epidermis: whorls five, the anterior one elongated, somewhat fusiform, rounded anteriorly, sculptured with fine, close-set revolving striæ, more distinctly indicated when the epidermis is present; the four posterior whorls form a conical spire, having a suture so profound that they seem invaginated and quite detached from each other. Aperture linear, widening anteriorly, and in front somewhat trigonal. Inner lip formed by a sharp, very prominent, abruptly twisted white fold, with a submarginal excavation, terminating acutely in front, in such a manner as almost to form a canal.

Found by *Col. Jewett* at Santa Barbara.

Length one inch; breadth one fourth of an inch.

There is no species described approaching to this, except *B. tenuis*, Adams, which differs widely in its proportions. The remarkable columellar fold would almost bring it within the genus Tornatella, but its general characters decide in favor of Bulla. It may most properly be placed in the subgenus Akera, though some of its abnormal characters bring it in close alliance with Tornatina.

BULLA (TORNATINA) CEREALIS (Pl. XIV. Fig. 9.)

T. parva, ovoideo-fusiformis, solidula, eburnea, levigata; spira exserta, tabulata, mamillata; anfr. quatuor; apertura angusta, antrorsum dilatata, labro ad medium saliente, posticè sensim approximante, et ânte suturam coadunato; columella callosa, plicâ validâ instructa.

Shell minute, solid, ovoid fusiform, ivory white and polished; spire prominent, composed of three or four whorls rising by regular grades, and mamillate at tip; aperture linear above, gradually widening forwards; the outer lip, salient at the middle, and very gradually approaching the body of the whorl posteriorly, unites to it before reaching the suture; columellar margin callous its whole length, with a strong fold at base.

Length one fifth of an inch; breadth one twelfth of an inch.

Found at Santa Barbara by *Col. Jewett*.

In form and size this shell is scarcely to be distinguished from *B. gracilis*, A. Adams, which, however, is described as horn colored, and covered with revolving striæ; whereas this is ivory white, and exhibits no striæ whatever when much magnified. In terms it

agrees with the description of *B. infrequens*, C. B. Adams, and I should not presume to consider it different, had it not been examined by Prof. Adams himself.

PHYSA ELATA (Pl. XIV. Fig. 4.)

T. tenuissima, ovato-lanceolata, levigata, nitida, dilutè cornea, ad suturam decolorata; spira acuta, anfr. sex, convexiusculis, ultimo octantes septem longitudinis equante, anticè angustato; apertura angusta, trientes duos long. adequans; columellâ vix plicatâ.

Shell lanceolate ovate, very thin, smooth and glistening, pale horn color, colorless at suture; spire acute; whorls nearly six, distinct, slightly convex, the last one seven eighths the length of the shell, ellipsoidal, nearly symmetrical at the ends; aperture three fourths the length of the shell, narrow obovate-lunate, acutely rounded anteriorly; having on the pillar an imperfect fold, and a very thin callus on the body whorl.

Length seven eighths of an inch; breadth three eighths of an inch; length of aperture five eighths of an inch.

Inhabits Lower California. *Maj. Rich.*

An elongated species almost as slender as *P. hypnorum*, though very much larger, highly polished, with a very long aperture; pillar region tumid.

SIGARETUS DEBILIS (Pl. XIV. Fig. 17.)

T. parva, tenuis, lucida, depressa, mellea, striis numerosissimis obtusis volventibus, supernis majoribus, insculpta; spira superficiei generali congruens; anfr. duobus; apice ad quadrantem diametris sito: angulo ad peripheriam obtuso, versus aperturam sensim evanido; labio anticè dilatato.

Shell small, much depressed, thin, almost pellucid, pale honey-yellow color; whorls two, spire almost coincident with the general surface, apex at one fourth the diameter of the shell; periphery obtuse-angular, becoming more so as it approaches the aperture; ventral surface excavated at the umbilical region, with a slight unappressed lamina at that point; margin of the aperture having a very slight advance in the outline, as it approaches the peripheral angle; surface with very numerous and very delicate, obtusely excavated revolving striæ, much finer on the ventral than on the dorsal face.

Long diameter seven eighths of an inch; short diameter not quite half an inch; height one fifth of an inch.

Inhabits La Paz, Gulf of California. *Lieut. Green.*

It has the form of *S. haliotoideus*, and is nearly as smooth as *S. levigatus.* It is about the size of *S. planus*, and has the compressed form of *S. depressus.* Its honey-yellow color is peculiar.

NARICA OVOIDEA (Pl. XIV. Fig. 10.)

T. ovoidea, solida, albida, costis planulatis politis ad 11 cincta, interspatiis duplo angustioribus concinnè clathratis; spira acuta, anfr. 4, supernè tabulatis, ultimo magno, ovato: apertura ovata; labro crenulato; columellâ tenui, antrorsum concavâ, plicâ medianâ instructâ; umbilico conspicuo, profundo.

Shell ovoid, solid, dingy white, surrounded with well marked grooves and square shining ribs, about eleven on the large whorl and five on the others, the grooves about half the width of the ribs, and delicately clathrate with longitudinal bars; spire acute, whorls four, shouldered above, the last whorl composing the greater part of the shell. Aperture half the length of the shell, ovate, ribs rendering the outer lip crenate; inner lip rather sharp, concave in front, slightly attached to the whorl above and having a delicate fold at the middle. Umbilicus well marked and deep.

Length seven twentieths of an inch; breadth three twentieths of an inch.

Purchased at Mazatlan. *Col. Jewett.*

This curious shell it is difficult to classify; perhaps there is no genus now defined which can properly receive it. *Littorina* (?) *angistoma* and *excavata* C. B. Adams, seem to belong to the same group.

TEREBRA ARGUTA (Pl. XIV. Fig. 19.)

T. parva, acicularis, nitida, plicis longitudinalibus rectis acutis ad 10 ornata, interspatiis concavis; albida propè suturam fusco zonata, et interdum lineis flexuosis picta; apertura angusta, lunaris; anfr. 8 planulatis, ultimo ad basim spiraliter striato.

Shell small, acicular, very acute and slender, glistening, composed of about eight flattened whorls, having on each about ten acute longitudinal folds, the spaces between fluted; a few spiral lines around the base of the last whorl; aperture narrow lunate,

white or yellowish, with a more or less distinct dusky band near the suture, and sometimes pale flexuous lines on the larger whorls.

Length five eighths of an inch; breadth one eighth of an inch.

This elegant little shell is distinguished by its small size and slender form, and its simple fluted surface without revolving lines. It has much the form and surface of *T. nitida*, but the size of *T. fictilis* and *nassoides*.

TROCHUS MARCIDUS (Pl. XIV. Fig. 11.)

T. pyramidalis, solidula, vix striata, rufo-viridis; anfract. quinque planulatis ad suturam vix discretis; basis subplana, lævis, umbilico amplo profundo infundibuliformi, juxta aperturam partim tecto; apertura subrhombea, perobliqua; operculum tenue.

Shell of moderate size, strictly pyramidal, the distinction of the whorls being scarcely marked at the sutures; surface with fine incremental striæ, of a dull brownish and green color. Whorls about five, quite flat, the large one sharply angular at periphery. Base very slightly convex, highly polished and silvery near the aperture and around the umbilicus, which is deep, large and broadly infundibuliform, partially covered on the side of the aperture by a thin plate of shell, the margin of the funnel being indicated by an obtuse angle. Operculum very thin, of a dark amber color.

Axis seven eighths of an inch; diameter of base one and one eighth of an inch.

Inhabits Monterey. *Lieut. Green.*

In color and general appearance this shell would not at first sight be distinguished from *T. Montereyi*, Kiener; but it is a smaller and less elevated pyramid; and the base differs altogether in its perfectly plain, broadly tunnel-shaped umbilicus, and its entirely simple lip throughout.

TROCHUS PICOIDES.

Among the specimens obtained from Col. Jewett, was one from Santa Barbara, which would at first glance be pronounced to be *T. pica*. Being unprepared to see this species from the Pacific shores, I was led to make particular inquiry as to the certainty of its having been obtained alive at that place, and being satisfied on that point, I obtained the loan of three of the five specimens brought home.

On a critical comparison of the California with W. India specimens, the following differences seem to be constant, so far as these specimens are concerned.

W. India.	California.
Form strictly pyramidal.	A more elevated pyramid.
Whorls very slightly convex, suture somewhat constricted.	*Whorls* decidedly convex and more girt in at the suture.
Surface, corrugate or undate at right angles with the lines of increment.	*Surface* without undulations but girdled by a few obsolete ridges on the last whorl.
Flammules confused or blotched.	*Fulgurations* well defined.
Base with no tendency to distinct tessellation.	*Base* more or less tessellated with ranges of squarish black spots.
Lip black at edge, submargin dead white.	*Lip* nacreous and iridescent to the margin.
Aperture very oblique, its lip regularly sloping from junction to periphery.	*Aperture* less oblique, lip arched.
Columellar tooth well marked.	*Columellar tooth* obsolete; inner lip forming a regular sweep.
Columellar lip somewhat sinuous.	

As I have seen no young specimens from California, it is not unlikely that some of the above diagnostic marks may not prove constant in some stages, — the more elevated form, more convex whorls, and destitution of undulations may be regarded as the most important characters. I present this comparison for verification when more numerous specimens shall have been obtained. Should the differences prove constant, it will be one of the most remarkable examples of analogous species from correlative regions.

TROCHUS (MONODONTA) PYRIFORMIS.

T. ovato-conica, crassa, striis obtusis remotis anticè cincta, nigra, flavido obliquè et undulatim lineolata; spira conica, anfr. sex convexiusculis, ad peripheriam rotundatis; basis convexa, foveâ umbilicali albo-cinctâ notata, imperforata; apertura circularis; columella acuta, bidenticulata; labro acuto nigro; cavositas alba.

Shell thick and heavy, elevated ovate pyramidal, eroded at tip, without sculpture, bluish-black, or with a few obtuse revolving lines on the last whorl, with numerous oblique, fine, undulating stripes of yellowish crossing the lines of growth nearly at right angles. Whorls six, slightly convex; suture linear; periphery of the last whorl obtusely rounded; base convex, white at centre, with a small

umbilical indentation; aperture sub-circular; lip bevelled, sharp, blue black; submargin dead white; columella white, acute, with two denticles at lower part; fauces silvery white.

Axis one and a half inches; diameter one and one fourth inches.

Inhabits San Diego. *Lieut. Green.*

It has the shape, solidity, size, and coloring of *T. fragarioides*, Lk. *lugubris*, Lk. It is distinguished by not having its colors arranged in bands, in having an umbilical indentation, and two denticles on the columella.

MODULUS DORSUOSUS (Pl. XIV. Fig. 12.)

T. depressa, ovato-conica, solida, calcarea, ad peripheriam acuta et nodulosa, supra obscurè undulato-nodoso, infra conica, spiraliter insculpta; apertura sub-triangularis, labro acuto intus sulcato; columellâ et dente rosaceis; umbilico parvo, profundo.

Shell small, solid, depressed, ovate conic, dead white, the upper whorls as it were eroded, the outer one angulate, flattened or a little excavate above, varied with obsolete radiating folds by which the periphery is rendered nodulous; the nodules extend somewhat on the conical base which is sculptured by about six spiral grooves, one of which cuts the nodules. There are sometimes faint traces of dusky markings between the tubercles and on the basal ridges. Aperture subtriangular, lip sharp, grooved within; umbilicus small; tooth and columella tinted pale rose-red.

Diameters, transverse half an inch; vertical nearly one third of an inch.

Found at Acapulco. *Col. Jewett.*

This species is not mentioned in M. Petit's recent list of the species, but it approaches *M. obliquus*, and also *M. duplicatus*, both of which are described as spirally grooved above, and the former seems to have a sharp periphery.

CHEMNITZIA TENUICULA (Pl. XIV. Fig. 15.)

T. gracillima, lanceolata, nitida, cerina, infra suturam fuscescens; anfr. 10 planulatis, tabulatis, longitudinaliter ad 20-plicatis, striis numerosis volventibus leviter secatis; basi modo spiraliter striatâ; apertura angusta, ovata; labro acuto.

Shell small, elongated lanceolate, turreted, rather solid, shining,

wax yellow, a little dusky below the suture; whorls ten, flat, slightly shouldered above, marked by about twenty direct longitudinal folds, the summits of which are cut by numerous fine revolving striæ, deeper in the interstices, which also extend over the base of the shell, though the folds terminate at the periphery or are extended in delicate furrows. Aperture narrow ovate, lip sharp; revolving striæ apparent in the aperture.

Length three tenths of an inch; diameter one twentieth of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

In structure and sculpture it may be compared with *C. formosa.* It is, however, less accurately acicular, the posterior whorls decreasing more rapidly than the others.

CHEMNITZIA TORQUATA (Pl. XIV. Fig. 16.)

T. solida, turrita, lactea; anfrac. 8 convexiusculis, plicis longitudinalibus, flexuosis, perobliquis ad 16 ornatis; anfractu ultimo subangulato, basi inornatâ; apertura subovata, labro incrassato.

Shell minute, turreted, solid, milk-white, composed of eight moderately convex whorls, separated by a deep suture, each one with about sixteen very oblique, somewhat flexuose folds, quite well marked, not quite reaching the suture; the spaces between do not exhibit revolving lines. The last whorl is slightly angular at periphery, at which point the folds terminate, and the base is quite destitute of sculpture. Aperture subovate, lip thick; columella somewhat revolute, joining the lip below at nearly a right angle.

Length one fifth of an inch; breadth one twentieth of an inch.

Obtained at Santa Barbara. *Col. Jewett.*

In form it is much like *C. clathrata*, but is smaller and has no revolving lines, and the folds are much more oblique.

ODOSTOMIA GRAVIDA (Pl. XIV. Fig. 14.)

T. ovato-conica, elevata, eburnea, polita; spira acuta; anfr. 6 supra rotundatis, ultimo subangulato, trientes duos testæ adequante; apertura ovata, anticè rotundata, posticè acuta; labro expanso; plicâ columellari acutâ, transversâ, umbilico parvo suffossâ.

Shell small, ovate conic, elevated, ivory white, polished; whorls six, abruptly rounded above, rather flattened at the middle, the last

whorl two thirds the length of the shell; slightly angular at periphery; suture delicate. Aperture ovate, rounded at base; lip slightly everted, with a constriction behind it; spiral fold on the columella nearly transverse, elevated, sharp-edged, and a small umbilical opening is seen running under it.

Length one fourth of an inch; diameter one tenth of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

Has most of the characters of *O. conoidea* of Europe, but is perhaps proportionally broader.

ODOSTOMIA ACHATES (Pl. XIV. Fig. 13.)

T. ovato-lanceolata, nitida, longitudinaliter striata, albida, maculis elongatis, rubiginosis obscurè zonata; spira acuta, anfr. ad 9 vix convexis, ultimo dimidiam longitudinis adequante, basi rotundatâ et striâ unicâ submedianâ cinctâ; apertura angusta, ovata, posticè acuta; columellâ plicâ medianâ et duabus minoribus anterioribus instructâ.

Shell ovate lanceolate, shining, with distinct and rather distant longitudinal striæ; color, whitish near the suture and mottled with pale rust color, arranged somewhat in bands of elongated spots; spire acute, more rapidly tapering at tip; whorls eight or nine, scarcely convex, of which the last is half the length of the shell, entire and rounded at base, having a single impressed line around the middle, which runs up two or three whorls just behind the suture. Aperture narrow ovate, rounded in front, acute behind; lip acute; columella with a very obvious fold at the middle, and two much smaller ones between it and the base.

Length half an inch; breadth three twentieths of an inch.

Inhabits Mazatlan. *Col. Jewett.*

At first sight this would be taken for a land shell, like some of the slender and polished *Achatinellæ.* Its generic place is somewhat doubtful. It has not only the single fold of *Monotigma* and *Odostomia*, but at least two others like *Pyramidella.* It will some day be regarded as a distinct genus.

FUSUS AMBUSTUS (Pl. XIV. Fig. 18.)

T. fusiformis, subequilateralis, dilutè rufa, fusco tincta; spira elongata, acuta, anfract. ad octo convexis, subangulatis, liris crebris cinctis, et plicis conspicuis ad octo ornatis, propè suturam constrictis; apertura parva; rostro subrecto.

Shell fusiform, its largest diameter near the middle; color yel-

lowish, shaded with brown, so as to appear as if scorched; spire acute, having as many as eight convex somewhat angular whorls, which are girdled with elevated threads, and have about eight varicose folds on each whorl disappearing on the last half of the anterior whorl: suture deep, to which the upper part of each whorl gradually slopes. Aperture quite small, nearly semicircular, furrowed within; beak nearly straight, and with a very narrow channel.

Length one and three fourths of an inch; diameter three fourths of an inch.

From Mazatlan. *Lieut. Green.*

The only described species to which it bears any resemblance are *F. marmoratus*, Phil. from Australia, which is twice as long, more numerously ribbed, mottled in coloring, and with the whorls more angular; and *F. rostratus*, from the Mediterranean, which is smaller, and has remarkably rounded whorls with the folds extending to the suture.

ERATO LEUCOPHÆA (Pl. XIV. Fig. 20.)

T. obovata, solida, subfusca, valdè callosa, callo et basi eburneis; anfr. ad 4 subangulatis, ultimo supernè tabulato; apertura angusta, labro anticè excavato, concinnè denticulato.

Shell obovate, solid, polished, of a livid drab color, the lip and face ivory white. Whorls four or five, forming a low conical spire, the outer whorl angularly rounded above; lip thick, rising posteriorly somewhat above the body of the shell, slightly excavated anteriorly, and its inner margin very delicately toothed; columellar margin still more delicately toothed, with a conspicuous fold anteriorly.

Length one fourth of an inch; breadth one fifth of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

Very closely resembling *E. callosa*, Adams (Voy. of Samarang) differing chiefly in color, and the more delicate denticulations of the aperture.

CONUS RAVUS (Pl. XIV. Fig. 21.)

T. solida, ovoideo-conica, bulbosa, spiraliter argutè striata et anticè liris elevatis alternis majoribus instructa, fulvida, epidermide fuscescente induta; spira

elevata, convexa, anfr. ad 8 vix excavatis, ultimi angulo rotundato; apertura angusta anticè vix dilatata, labro posticè recedente, intus violacescente.

Shell ovoid conic, bulbous, solid, surface with microscopic revolving lines, and on the anterior portion a few delicate, regularly spaced, gradually increasing raised lines, alternately larger and smaller; color uniform pale fawn, paler posteriorly, covered by a smoky russet brown epidermis; spire above the obtusely rounded angle of the last whorl about one third the length of the shell; outline slightly convex; whorls seven or eight, slightly excavated, suture delicate and simple; aperture narrow, widening a little anteriorly; lip very sharp, gradually retreating at its posterior junction; interior faint purplish.

Length one and one third of an inch; breadth three fourths of an inch.

From Santa Barbara. *Col. Jewett.*

This species has the form of *C. solidus*, *cælebs*, and *Mozambicus*, and more especially of *C. fabula* Sowb. But it differs in color from all except *C. cælebs*, from the Philippine Islands, which shell has distinct granular striæ and is more slender. The color is nearly that of *C. figulinus.*

CONUS COMPTUS (Pl. XIV. Fig. 23.)

T. biconica, abbreviata, polita, anticè seriebus granularum cincta, albida, maculis castaneis picta, et lineis volventibus articulatis ubique ornata; spira quadrantem testæ adequans ad peripheriam subcarinata; anfr. ad 8, gradatim surgentibus, vix excavatis, striatis: apertura angusta; intus violacescens.

Shell accurately biconical, everywhere bound by right lines, rather short, surface shining, girdled with distant series of granules anteriorly, quite smooth elsewhere; ground color bluish white, clouded with chestnut blotches arranged somewhat longitudinally, the lighter portions everywhere ornamented with delicate revolving lines articulated with dead white and brown; spire about one fourth the length of the shell, the angle at its base acute and somewhat carinate; whorls eight or nine, rising by regular grades at the suture, somewhat excavated and spirally striated; coloring nearly tessellated with white and brown; aperture narrow, scarcely widening anteriorly, bluish within.

Length one and one fourth of an inch; breadth three fourths of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

Approaches in form *C. orion* and *classiarius*, both of which are more elongated; its proportions are, perhaps, more like *C. fulgurans*. Its coloration is like some varieties of *Cedo nulli*, and *C. archon*, or like the darker varieties of *C. portoricanus*. It is probably the species named by Menke, in his Catalogue of Mazatlan Shells as *C. achatinus*.

CONUS PUSILLUS (Pl. XIV. Fig. 22.)

T. parva, conica, polita, seriebus ad octo granulorum remotorum anticè cincta; spira planulata, anfr. 8 coronatis constructa; alba, maculis obliquis elongatis irregularibus aurantiacis bicincta; apice rufo; apertura angusta, linearis.

Shell quite small, conic, very slightly swollen posteriorly, surface smooth, the anterior half having about eight circles of beads so spaced as to form squares; spire nearly level, composed of eight coronate whorls divided by a spiral groove; color white, with a broad band of irregular, oblique elongated orange spots posteriorly, a fainter one near the tip, and spots between the tubercles orange; tip dark orange; aperture very narrow.

Length half an inch; breadth three tenths of an inch.

Inhabits Mazatlan. *Col. Jewett.*

Allied to *C. sponsalis*, especially in coloring, but is smaller, without convex outline, more elongated, spire much less elevated. Nearly the same remarks apply to *C. nanus*, in which there is less resemblance as to color. Its proportions are more like *C. speciosissimus*.

PHOLAS OVOIDEA (Pl. XV. Fig. 1.)

T. ovoidea, crassa, cinerea, posticè valdè hians et epidermide valdè prolongata, anticè laminâ calcareâ clausa; valvis ad extremitates rotundatis, sulco lato mediano partitis; portione posticâ inornatâ; portione anticâ laminis concentricis undulatis confertis et plicis radiantibus cancellatâ; apicibus ad quadrantem anteriorem sitis; apophysis cardinalis subulata, ad apicem excavata: laminæ apicales haud appressæ, duplicatæ; valvulæ cardinales —— ?

Shell ovoid, rather solid, chalky white, very widely gaping behind the beaks which are placed at the anterior fourth of the shell,

slightly gaping also in front, the anterior ventral opening mostly closed by thick calcareous plates, one of which partially overlaps the other, somewhat marked by converging ridges: both extremities broadly rounded; disk of the valves divided by a broad sulcus barred by the lines of growth, and passing from the beaks to the middle of the ventral margin; posterior portion unsculptured; anterior portion ornamented with crowded, elevated, undulated concentric laminæ, decussated by acute radiating ribs arranged somewhat in pairs; in front of the beaks the dorsal margin is reflexed, not appressed, and then doubled upon itself: cardinal valvulæ missing; interior yellowish white; cardinal apophysis long, slender, a little expanded and excavated towards extremity, directed obliquely backwards. An extensive prolongation of the epidermis closes the posterior margins and forms a long tube for the protection of the siphons.

Length three inches; breadth one and three fourths inches; height two inches.

This shell is remarkable for its short ovoid form. It is closely allied to *P. crispata* as to its wide gape and epidermal tube and its general sculpture; but the latter shell does not gape so widely, is acute anteriorly, and has not its ventral gape closed by calcareous plates. *Pholas truncata* is more cylindrical, truncate posteriorly and acute anteriorly. *P. concamerata* is much smaller, tapers posteriorly, slightly gaping, and is prolonged by corneous plates.

PETRICOLA BULBOSA (Pl. XV. Fig. 5.)

Petricola bulbosa Gould: Proc. B. S. N. H. Nov. 1851, IV. 88.

T. solida, ovato-cuneata, posticè hians, straminea, costis numerosis parvis compressis radiantibus ornata ad interstitiis concentricè striatis: apicibus ad trientem anteriorem tumidis; latere antico subgloboso; latere postico compresso, subtriangulari, ad apicem truncato; margine ventrali sinuato: intus livido, cicatricibus calcareis; cardo dente unico ad valvam dextram, subulato, recurvo instructus.

Shell ovate, solid, inequilateral, yellowish white, having the surface ornamented with numerous radiating, compressed, rib-like lines, and closely wrinkled between them by the lines of growth; beaks at the anterior third, and tumid, as are the disks against the beaks; anterior part broadly rounded; posterior part subtriangular, the apex truncate; ventral margin somewhat constricted; interior livid

and even purple posteriorly; cicatrices broad and chalky white, very distinct; siphonal sinus semicircular; tooth on the right valve short, subulate, recurved.

Longitud. diam. one and one eighth inches; vertical, seven eighths of an inch; transverse, six eighths of an inch.

Inhabits Guaymas. *Lieut. Green.*

This is the analogue of *P. rocellaria* Lk. and scarcely to be distinguished from it; but its posterior half seems to decline much more rapidly; the radiating folds are much less marked; on the left valve is a single tooth; on the right are two, less developed; the pallial scar, between the siphonal sinus and anterior muscular scar, is not sinuous, and grows larger; interior not always tinted, nor cicatrices chalky.

OSTEODESMA NITIDUM (Pl. XV. Fig. 6.)

T. transversa, subfalcata, ventricosa, tenuis, lucida vividè margaritacea, concentricè undulata plerumque nuda; apice ad trientem anteriorem; latere antico rotundato; latere postico attenuato, truncato, subascendente, utroque extremitate lineis radiantibus remotis striato.

Shell very thin and fragile, transparent, extremely bright pearly, somewhat conspicuously undulated concentrically, destitute of epidermis and of radiating striæ except at the posterior tip, where it is very thin and pale straw color; beaks at the anterior third, elevated; disks tumid; anteriorly rounded; posterior portion ascendant, gradually narrowing till its truncated tip becomes about half as elevated as the valve at the beaks.

Longitud. diam. seven eighths of an inch; vertical and transverse three eighths of an inch.

Inhabits Santa Barbara. *Lieut. Green.*

Differs from *O. hyalinum* in being more inequilateral, more recurved, the surface more pearly and free from striæ; *O. floridanum* is more ventricose, much more attenuated posteriorly, the surface more dead, and the striæ much more remote from each other.

LUTRARIA VENTRICOSA.

Lutraria ventricosa Gould; Proc. B. S. N. H. Nov. 1851. IV. 89.

T. tenuis, fragilis, ventricosa, ovato-cuneata, alba, epidermide stramineâ induta, rugis remotis radiata, apicibus vix antemedianis, tumidis; latere antico

angustato, compresso; latere postico dilatato; facie dorsali valdè declivâ, angulo obtuso limitato, et aream latam, utrinque lineâ submarginali partitam, ostendente; intus alba, punctis nitidis notata.

Shell ovate-cuneate, ventricose, thin and fragile, white and smooth, covered with a dirty straw-colored epidermis, with here and there delicate radiating wrinkles: beaks slightly anterior, tumid and decidedly arched; disk everywhere tumid; anterior half narrowed and somewhat acutely rounded at extremity; posterior end broad and distinguished by a ridge running from the beaks to the posterior ventral angle, quite acute near the beaks, but becoming gradually obsolete; at this ridge the valves are inflexed nearly at right angles, presenting a broad, excavated area, delicately plicated near the beaks, and also subdivided by a fainter submarginal ridge. At its posterior point the shell is slightly gaping. Lateral teeth well developed; ligament pit large, deep, and oblique; V-tooth small, delicate, supported by bars anteriorly, under which, and above the lateral tooth runs a deep excavation. Siphonal sinus narrowing to a blunt point. Interior dead white, besprinkled with shining dots.

Inhabits Mazatlan. *Lieut. Green.*

The resemblance between this species and *M. carinata,* from the coast of Carolina and the Gulf of Mexico, with which it has hitherto been confounded, is very great. Our shell, however, is larger, less solid, much more ventricose, and is destitute of the crest on the angle which limits the posterior dorsal area, found in *M. carinata.* The anterior end is also narrower, the ligament cavity smaller and more oblique, and the beaks are more arching. Its form is almost precisely that of *Unio ovatus.* A small African species (*M. albida?*) is a miniature of the shell. The posterior slope, however, is less vertical, the anterior side less acute, and it has deeply impressed concentric grooves in front of the beaks.

LUTRARIA UNDULATA (Pl. XV. Fig. 7.)

Lutraria undulata, Gould; Proc. B. S. N. H., Nov., 1851. IV. 89.

T. candida, papyracea, fragilis, ovata. posticè hians, concentricè undata, nisi propè marginem posticum et ad aream impressam dorsalem concinnè rugosa; apicibus vix anticis: latere anticè rotundato; latere postico angustato, com-

presso ad apicem rotundato, margine dorsali declivo, rectiusculo, costâ submarginali munito.

Shell milk white, fragile, concentrically undulated, ovate, ventricose; beaks a little anterior, gaping widely behind; the undulations ending abruptly at a posterior submarginal ridge; the undulated portion is also minutely corrugated, the wrinkles running from the beaks towards the margin; an impressed area in front of the beaks is also destitute of waves; anterior half broadly rounded and tumid; posterior half narrowed, compressed and acutely rounded, the superior margin being a rectilinear slope.

Length two and a half inches; breadth one and one fourth inches; height two inches.

Inhabits La Paz, Lower California. *Lieut. Green.*

Differs from *L. canaliculata* Say, of S. Carolina, in its strictly ovate form, in having the beaks anterior instead of posterior; in having the posterior half less compressed and more gaping, and in the acute ridge at which the undulations terminate. While in size, texture, color, and surface they are remarkably similar, they are quite reversed in their proportions.

AMPHIDESMA FLAVESCENS.

Amphidesma flavescens, Gould; Proc. B. S. N. H. Nov., 1851, IV. 89.

T. subrotunda, compressa, dilutè aurantia demum albida et epidermide fuscâ, tenui induta, striis concentricis lamellosis, lineis radiantibus decussatis insculpta; apicibus medianis, acutis, haud elevatis; area dorsalis antica excavata; area dorsalis postica lanceolata, concava, lineâ marginata; intus flavotincta punctis lucidis notata; sinu siphonali spatulatâ, striis crebris divergentibus insculptâ; foveâ ligamentali profundâ, productâ; dente laterali antico apici approximato.

Shell subrotund, nearly equilateral, moderately convex, anterior end broadly rounded; posterior dorsal margin straight and sloping, the end less broadly rounded; posterior umbonal slope with an indistinct ridge; beaks acute, not prominent, anterior dorsal area excavated; posterior dorsal edge long lanceolate, concave, bounded by a distinct angle; surface pale orange near the beaks, becoming dingy white at the older stages, and covered by a dirty greenish epidermis; marked by concentric lamellar striæ, crossed by fine

radiating striæ, especially across the disk. Interior tinted (melon) yellow, spangled with shining dots; siphonal sinus spatulate, veined with numerous diverging striæ; ligament pit deep and long; anterior lateral teeth approximate to beaks.

Longitudinal, vertical, and transverse diameters two and three eighths, two and one eighth, and one and one fourth inches.

From San Diego. *Lieut. Green.*

Usually found about half this size; the concentric lamellar striæ are then conspicuous; but these become worn off, and the shell grows more irregular and coarse towards the margin; the interior is faintly tinted yellow when young, but very richly so when old. It is closely allied to *A. corrugatum*, Sowb.

MACTRA NASUTA.

This species, described in Proceedings Bost. Soc. Nat. Hist., Nov., 1851, IV. 88, agrees so nearly with *M. falcata*, also described by me, (op. cit. III. 216,) that I hesitate to reproduce it as new without a direct comparison of the two shells, which I have it not now in my power to make. They will for the present, therefore, be regarded as synonymous. *M. falcata*, however, was found at Puget's Sound, while *M. nasuta* was found by Maj. Rich at San Pedro, and by Lieut. Green, (with a doubt,) at Mazatlan.

MACTRA MENDICA (Pl. XV. Fig. 4.)

Mactra mendica, Gould; Proc. B. S. N. H., Nov. 1851. IV. 88.

T. ovato-triangularis, compressa, solida, concentricè striata, epidermide rufâ induta; apicibus antemedianis, acutis, incurvatis, margine dorsali utrinque citò declivi; latere antico acutè rotundato; latere postico triangulari, desuper viso angustè cordiformi, fortiter striato: intus lactea; sinu siphonali, parvulo; fovea ligamentali retrorsùm profunda, dente V-formi parvo; dentibus lateralibus conspicuis.

Shell ovate triangular, small, solid, faintly striated concentrically, and coated with a pale fawn colored epidermis; beaks antemedian, acute, incurved, dorsal slopes very steep, abrupt, anterior end rather acutely rounded; posterior end triangular, acute angled, with an abrupt ridge along the posterior umbonal ridge, the enclosed posterior area is narrow heart-shaped, more coarsely striate, with the lips a little protuberant. Interior milk white; a very slight siphonal

sinus. Hinge with a very small triangular ligament pit burrowing under the beaks, in front of it a small divaricate tooth, and a well marked lateral tooth on each side.

Long. diam. one inch and one eighth of an inch ; vertical diam. six eighths of an inch ; transverse diam. half an inch.

Inhabits Mazatlan. *Lieut. Green.*

A remarkably small and solid species, with a very unusual hinge. It resembles, in general, small specimens of *M. similis*, but is more triangular and more ventricose, as well as more solid. It is closely allied to *M. cuneola*, Gould.

DONAX FLEXUOSUS (Pl. XV. Fig. 8.)

T. triangularis, cuneata, undulato-flexuosa, anticè acuta, area postica lata, alta, subplanulata, undique striis exilibus profundis, radiantibus insculpta; apice post mediano ; angulo umbonali posticè carinato ; margine ventrali excurvato ; colore albo vel stramineo, intus interdum posticè violacea.

Shell triangular, cuneate, solid, flexuose, white or straw colored, sculptured with very regular, crowded, deep radiating grooves, quite distinct posteriorly and gradually disappearing at the anterior margin, on the posterior area somewhat roughened by the concentric striæ : apex posterior ; valves from the apex to the middle of the ventral margin tumid, between this and the anterior end constricted, ventral margin correspondingly excurved and incurved ; anterior end nasute ; posterior umbonal slope sharply carinate ; posterior area very broad and nearly flat ; basal angle very acute ; interior shining white or flesh colored, often tinted at the tip and along the posterior edge with violet ; lateral teeth quite strong.

Diameters, longitudinal three fourths of an inch ; vertical half an inch ; transverse two fifths of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

One of the most remarkable species of the genus on account of its triangular form, its undulating sides, broad and flat posterior area, and deep, regular, crowded radiating grooves.

DONAX OBESUS (Pl. XV. Fig. 9.)

Donax obesus, Gould ; Proc. B. S. N. H., Nov. 1851, IV. 90.

T. parva, solida, ovato-cuneata, ventricosa, nitida, radiatim leviter striata, coloribus albidis et fulvidis omnino vel radiatim picta, et plerumque zonis vio-

laceis ornata; angulo postero-dorsali rectilineari; facie posteriori cordiformi, sub-biangulari; latere antico angustato, citò rotundato; margine ventrali denticulato, posticè coarctato; intus alba vel flavescens, violaceo nubeculata, ad marginem dorsalem fuscata.

Shell solid, ovate triangular, ventricose, the surface faintly radiate striate, more distinctly so posteriorly, and then as if varnished so as to obliterate the furrows; color bluish white, pale fawn color, or rayed with these colors, and most specimens have one or more bluish zones; anterior dorsal slope rectilinear and nearly at a right angle with the posterior, which is a little curved; posterior end heart-shaped, faintly biangular, the umbonal angle obtuse and rather ill defined, but the radiating striæ going to the posterior basal angle more distinct than elsewhere: anterior end rather acutely rounded; a very slight constriction of the basal margin posteriorly gives the anterior portion a somewhat pouched appearance. Teeth of the hinge well developed. Interior white, inclining to yellow, with violet clouds, especially within the pallial impression; a marginal blotch along each dorsal edge seems to be pretty constant. Basal margin with very decided teeth about the middle, becoming gradually more delicate in each direction.

Long. diam. nine tenths of an inch; vertical diam. six tenths of an inch; transverse four tenths of an inch.

Inhabits San Diego. *Lieut. Green.*

In general characters, especially in striation and posterior area, it is much like *D. anatinum*, but that shell is more decidedly acuminate anteriorly; the angle at the apex is less nearly a right angle, and the posterior basal termination protrudes more; the striæ, too, are decidedly punctate along the anterior umbonal slope. Some small specimens are very broad proportionally. Some have the anterior end nearly as acute as *D. anatinum*, but none the posterior end so much abbreviated, so nearly vertical. The coloration is quite various, and often is mingled with lilac, especially near the edge.

LUCINA ORBELLA (Pl. XV. Fig. 3.)

Lucina orbella, Gould; Proc. B. S. N. H., Nov. 1851. IV. 90.

T. parva, tenuicula, subglobosa, albida, concentricè inequaliter striata; apicibus medianis, haud eminentibus, absque lunulâ anticâ; lateribus ferè sym-

metricis: intus alba. Cardo valvæ dextræ dentibus duobus instructus quorum antico minore, postico bifido; valvæ sinistræ duobus quorum antico bifido, postico perobliquo; dentibus lateralibus nullis; cicatricibus inconspicuis, palliali serie punctorum composito.

Shell small, rather thin, subglobose, dingy white, marked with delicate lines of growth, which at some parts are more conspicuous than at others, and render the surface somewhat irregular; beaks very nearly median, not prominent; no distinct lunule in front of them: ligament prominent; extremities a little above the middle of altitude, very nearly symmetrical. Interior white. Hinge with two direct teeth in the right valve, of which the anterior is smallest, and the posterior is bifid; and two in the left valve, of which the anterior is bifid and the posterior very oblique; lateral teeth none; muscular impressions faint, very large; pallial impression indistinct, composed of a series of polished dots.

Length four fifths of an inch; height six eighths of an inch; breadth half to five eighths of an inch.

From San Diego. *Lieut. Green.* Santa Barbara. *Col. Jewett.*

The size and globose form of this species recalls *L. columbella*, Lk., (*L. Adansonii*, D'Orb.): but the shell is much less solid, the beaks less elevated, no areas before and behind them, and the surface is not lamellar. *L. globularis* may be more like it. Some specimens are nearly perfect spheres, and all of them are very convex lenses.

ARTHEMIS SACCATA (Pl. XV. Fig. 2.)

Arthemis saccata, Gould; Proc. B. S. N. H., Nov. 1851, IV. 91.)

T. tenuis, albida, ventricosa, rotundato-rhomboidea, subequilateralis, margine ventrali subpendulo; apicibus eminentibus; lunula cordata, lineâ impressâ finita; valvis tumidis, posticè compressis et ad marginem sinuatis; cardo valvæ dextræ dentibus binis fissis instructus, valvæ sinistræ dentibus tribus.

Shell thin, white, of a rounded rhomboidal outline and ventricose form, the beaks being prominent, the ventral margin produced or pendulous and the two ends rather suddenly curved above the middle: surface delicately and closely striate, with a zone or two of dusky at stages of growth; a cordate lunule is defined by an impressed line in front of beaks; the disk of the valves is very tumid, but the posteriòr umbonal slope is a little constricted, mak-

ing a sinuosity at the posterior inferior angle. Hinge of two deeply cleft divergent teeth in the right valve, (or four arranged in pairs,) and three in the left, of which the middle one is unequally bifid. No lateral teeth. Siphonal sinus acute, extending to the centre of the valve.

Length one and three fifths inches; height one and a half inches; breadth seven eighths of an inch.

Inhabits Mazatlan. *Lieut. Green.*

This shell has very nearly the outline of *Cyth. prostrata,* especially its pouched ventral margin, but is much more ventricose and very different in sculpture. It is also very much like *A. tenuis,* Sowb., but is larger, and has a distinct lunule. *A. Chinensis* is also allied in form.

TELLINA MINIATA (Plate XVI. Fig. 1.)

Tellina miniata, Gould; Proc. B. S. N. H., Nov. 1851, IV. 90.

T. transversa, ovata, tenuis, valdè hians, convexiuscula, concentricè striata, erubescens; apicibus antemedianis; latere antico semiovali; latere postico ovato-triangulari; margine ventrali subpendulo; intus miniata; cardo dentibus binis divaricantibus tenuibus utraque valvâ instructus; nymphis conspicuis.

Shell transversely ovate, thin, widely gaping posteriorly, slightly convex, delicately striate concentrically, with vestiges of numerous radiating striæ; deep roseate at the beaks and across the middle of disks, and zoned with roseate elsewhere: beaks anterior, acute; anterior end semioval; posterior end ovate-triangular, acute at tip, which is near the median height; dorsal margin slightly declining; ventral margin a little depending at middle. Interior bright rose-red throughout: siphonal sinus opposite the middle of the ventral margin, pyramidal and truncated at tip. Hinge with two delicate, diverging, equal cardinal teeth in each valve; nymphæ strongly developed.

Diam. longitudinal two inches; vertical one and one fourth inches; transverse five eighths of an inch.

Inhabits San Juan. *Lieut. Green.*

Compared with the analogous West India species, *T. rosea,* Gmel., it is longer, thinner, less lenticular, more inequilateral, more acuminated posteriorly, ventral and posterior margin less convexly arcuate; color more roseate externally, and altogether so internally.

In that species the hinge has only a single tooth, stouter or with an obsolete one at its base.

TELLINA TERSA (Pl. XVI. Fig. 2.)

T. modica, convexiuscula, ovato-triangularis, alba, concentricè vix striata: apice postmediano; latere antico rotundato, supernè compresso; latere postico triangulari, apice subacuto, margine dorsali recto, citò desinente: dentibus lateralibus obsoletis.

Shell moderately large, inequilateral, rather convex, ovate-triangular, white, varied with milky and watery white zones; incremental striæ fine and irregular; apex one fifth nearest the posterior end, which is triangular, (the dorsal slope very rapidly declining,) slightly truncate at tip, the submarginal flexure well marked; anterior half broadly rounded, dorsal edge somewhat compressed; ventral margin regularly arcuate; lateral teeth wanting, or consisting of a slight submarginal ridge.

Diameters, longitudinal one inch; vertical seven tenths of an inch; transverse three tenths of an inch.

Inhabits Panama. *Col. Jewett.*

It has a general resemblance to *T. lineata*, Turt., but is smaller, thinner, more compressed, and has no lateral teeth. It is more closely allied to *T. plebeja*, but is more equilateral and quite white. It has so few obvious characters that it is very difficult to describe.

TELLINA PURA (Pl. XVI. Fig. 3.)

T. parva, sub-elliptica, vix inequilateralis, tenuis, lucida, vel zonis lacteis zonata, striis minutissimis radiata; apice acuto; latere antico semi-ovali; latere postico modicè angustato, truncato, hiante, plicâ admodum conspicuâ: intus nitida, striis elevatis tenuibus radiata; dentibus lateralibus carentibus.

Shell small, compressed, suboval, nearly equilateral, thin and lucid except where obscured by zones of opaque white, shining, with numerous microscopic radiating striæ; apex acutely elevated; anterior half semi-elliptical, rounded at extremity; posterior half a little narrowed, the dorsal margin declining in nearly a right line, tip moderately truncate. Within, shining, and marked by numerous minute, raised, radiating lines; lateral teeth wanting.

Diameters, longitudinal, one inch; vertical three fifths of an inch; transverse three tenths of an inch.

Inhabits Panama. *Col. Jewett.*

There is no species figured in Sowerby's Thesaurus, nor described by Prof. Adams, which bears any near resemblance to this. It is remarkable for its symmetrical form and great simplicity.

TELLINA GEMMA (Pl. XVI. Fig. 5.)

T. parva, inequilateralis, transversa, ovato-triangularis, striis rotundatis concentricis ordinatis insculpta, rosea, albido vix radiata; latere antico semiovali, supernè acutè rotundato; latere postico breviore flexuoso, sub-triangulari; flexurâ valdè acutâ; margine ventrali posticè incurvo; intus vividè rosea.

Shell very small, inequilateral, transverse, triangular elliptic, rather solid, sculptured with crowded, rounded, concentric striæ, which become somewhat lamellar posteriorly; rose-colored, with a few delicate radiating white pencils; apex about one fifth behind the middle; anterior part semi-oval, the dorsal outline rectilinear and the extremity more abruptly rounded above than below; posterior portion subtriangular, flexuous, the dorsal margin somewhat convex, tip truncate; the submarginal fold well marked, and defined by a sharp angular ridge on the right valve; ventral margin incurved posteriorly; interior bright rose red.

Diameters, longitudinal, three fifths of an inch; vertical three tenths of an inch; transverse three twentieths of an inch.

Inhabits San Juan. *Lieut. Green.*

The species which it resembles somewhat in form and color are *T. distorta*, *rhomboidea*, and more especially *T. scalpellum*, which is pellucid, shining, and nearly destitute of flexure.

TELLINA (STRIGILLA) FUCATA (Pl. XVI. Fig. 4.)

T. (*Strigilla*) *fucata*, Gould; Proc. B. S. N. H. Nov. 1851. IV. 91.

T. lenticularis, rotundata, ovato-trigona. *T. carnariæ* simillima, albida, rosaceo zonata, sulcis ad declivitates umbonales angulatis arata; intus omnino miniata.

Shell of a subcircular or ovate trigonal lenticular form, inequilateral, whitish, or roseate zoned and tipped with color more intense, and with a pale ray on the anterior slope in the darker specimens; the surface furrowed with oblique striæ, flexed at nearly right angles on each of the umbonal slopes; interior deep carmine red throughout.

Diameter, longitud. seven eighths of an inch ; vertical four fifths of an inch ; transverse three eighths of an inch.

Inhabits Mazatlan. *Col. Jewett.*

This species is so similar to the well known *T. carnaria*, of the West Indies, that it is best described by a comparison with it. Its form usually is more rounded ; striæ less numerous and larger, forming a more decided angle on the posterior slope ; so that on the disk they are more nearly vertical ; and on the anterior slope the angle they form is so acute as to render them confused along the margin, nor have they any undulations at this border. The interior is deep carmine throughout, whereas *C. carnaria* is more roseate, and the border is always white ; cardinal teeth of left valve less divaricate. Fig. 38, of Sowerby's Thesaurus, seems to represent this shell.

CYRENA ALTILIS (Pl. XVI. Fig. 5.)

T. solidiuscula, subtriangularis, subequilateralis, ventricosa, tenuè striata, calcarea, epidermide tenui cinereâ induta ; umbonibus antemedianis valdè elevatis, declivitate umbonali angulato ; facie dorsali antico cordiformi, excavato, margine recto, ad extremitatem citò rotundato ; margine dorsali postico arcuato ad apicem subtruncato ; limbo marginali interiori violacescente, submargine incarnato.

Shell solid, obliquely subtriangular, ventricose, calcareous, covered with a thin ashy-green epidermis ; beaks a little antemedian, elevated, pointed, incurved and antrorse ; posterior dorsal slope decidedly angular, anterior much less so ; disks gibbous ; ventral margin regularly arcuate : anterior dorsal aspect cordiform, somewhat excavate, margin rectilinear, extremity briefly rounded ; posterior dorsal margin somewhat convexly arcuate and compressed, and more broadly rounded than the anterior ; hinge well developed ; cavity of beaks profound ; hinge margin white, disk bluish white, region of pallial impression flesh colored ; margin violaceous, simple.

Long. diam. one and three eighths inches ; vertical diam. one and a half inches ; transverse diam. one and one fourth inches.

One specimen is marked "Mexico," by *Maj. Rich ;* another, "Mazatlan (?)" by *Col. Jewett.*

Compared with *C. solida*, with which it is nearly related, it is less solid, the surface comparatively smooth, and the epidermis smooth, the beaks much more elevated, the umbonal ridge sharper,

the anterior end much more acutely rounded than in any other species, the cardinal teeth much more delicate and not tinted violet; impressions much less profound.

CARDIUM LUTEOLABRUM.

Cardium luteolabrum, Gould; Proc. B. S. N. H., Nov. 1851. IV. 91.

T. magna, ovato-globosa, posticè truncata, albida epidermide tenui lutescente induta; apicibus submedianis, tumidis, attigentibus; valvis ventricosis radiatim costatis nisi ad marginem dorsalem anticalem; costis 42 rotundatis canali profundo sejunctis, et aculeis prostratis ad angulum anticum armatis, postremis fornicatis; intus alba, dentibus marginalibus croceo tinctis.

Shell large, ovate globose, slightly oblique, broadly and obtusely truncate posteriorly, dingy white, covered with a dirty yellow epidermis; beaks tumid, touching; valves with a slight posterior umbonal angle, with forty-two rounded ribs, leaving a small plain area in front of the beaks; they are separated by deep rectangular channels about half the width of the ribs; they are naked at the beaks and centre of the disk, but the lateral ones bear on their external edges oblique, somewhat seedlike aculei, which become broader and almost vaulted posteriorly: interior white, with the marginal serratures very deep and saffron colored; grooved partially to correspond with the external ribs.

Longitudinal, vertical, and transverse diameters three and one fourth, three, and two and one fourth inches.

Inhabits San Diego. *Lieut. Green.*

It would at first glance be taken for *C. pseudolima*, a species from Zanzibar. It is more globose, less rhomboidal, the posterior side shorter and less angular; it has six more ribs, which are narrower and more developed on each side, with deeper and more abrupt grooves, and the spines are on the edge instead of the centre of the ribs; margin more strongly dentate, the denticles acute instead of square, and continued round to the ligament, and yellow instead of roseate; interior distinctly grooved, exterior without fleshy tint. The portions destitute of aculei exhibit the scars from which they have been detached. Agrees pretty well with *C. quadrigenarium*, Conr.; color not variegated.

C. blandum is smaller, the ribs transversely barred, and with no indications of aculei; the interior differently colored.

ANODON CICONIA.

Anodon ciconia, Gould; Proc. B. S. N. H., Nov. 1851. IV. 92.

T. solidula, transversa, oblongo-ovata, ventricosa, epidermide lutescenti-corneâ induta: apicibus ad trientem anticum long. sitis, eminentibus, acutis; latere antico angusto, rotundato; latere postico dilatato, ad apicem acuto, margine dorsali haud angulato; margine ventrali rectiusculo, anticè hiante, declivitate postico tumido, haud angulato; margarita ex ochraceâ incarnata demum argentea; cavositas apicalis ampla.

Shell rather solid, transversely oblong ovate, ventricose; epidermis yellowish horn color: beaks at the anterior third, prominent, acute; anterior half narrowed, the dorsal margin direct or a little concave, extremity rounded, a little above the middle; posterior half widening; dorsal edge at first a little arched, then obliquely truncate, but without forming an angle; tip acute; ventral margin nearly straight, gaping anteriorly; posterior umbonal slope tumid, and not angulated. Nacre ochreous, tinted flesh color on the disk, becoming silvery at margin; cavity of the beaks capacious.

Length four inches; height two and three eighths inches; breadth one and one fourth inches.

From the Collection of Lieut. Green, and marked "Mexico (?)." It is evidently an equatorial type, and closely resembles *A. anserina*, from Brazil. It is thicker in substance, more tumid on the posterior half, the epidermis and nacre are quite differently colored. The posterior dorsal and ventral margins have a corresponding slope, a little arched, and come together at the middle of the altitude. It is more like *A. implicata* than any other North American species.

MYTILUS GLOMERATUS (Pl. XVI. Fig. 8.)

Mytilus glomeratus, Gould; Proc B. S. N. H., Nov. 1851. IV. 92.

T. parva, solidula, arcuatim oblongo-ovata, nitida ex indicâ nigrescens, posticè obtusa; apicibus remotis, excurvatis; valvis ventricosis obliquè sub-angulatis, margine ligamentali recto, demum subitò arcuato; margine ventrali recto vel excavato; cardo alterâ valvâ dentibus duobus, alterâ tribus; intus argentata, ad limbum nigra incrassata et radiatim striata; cicatricibus profundis.

Shell small, oblong ovate, arcuate, rather solid, shining, striæ of growth conspicuous, deep indigo blue passing into jet black, at the

posterior end gibbous, the breadth and height about equal, and equal to two thirds the length; valves very convex, somewhat angular longitudinally along the middle; beaks acute, projecting, remote, excurved; ventral margin rectilinear or a little concave; hinge margin at first direct and then strongly arcuate; dorsal margin somewhat diverging from the ventral; posterior end broadly rounded; hinge with two distinct denticles in one valve and three in the other; ligament excavation deep and broad, the inner plate cribriform. Interior silvery on the disk, smoky black at the margins; muscular and palleal cicatrices very deep; limbus thick, radiate striate.

Largest specimens, length five eighths of an inch; breadth and height three eighths of an inch.

San Francisco. *Maj. Rich.*

A very remarkable species clustering upon sea weed in the most crowded manner, so that a string of them reminds one of a thickly crowded cluster of bloom raisins; so thick are they that the valves of two adjacent species, not having room to open freely, wear each other nearly through by the friction of opening and shutting. This circumstance, together with the very strongly developed hinge and deep cicatrices, forbid the idea of their being young specimens. Byssus is very coarse, wax yellow.

LITHODOMUS FALCATUS (Pl. XVI. Fig. 9.)

Lithodomus falcatus, Gould; Proc. B. S. N. H., Nov. 1851. IV. 92.

T. fragilis, margaritacea, subcylindracea, falcata, posticè ad declivitatem umbonalem valdè angulata, epidermide castaneà, rugis interdum bifurcatis corrugatâ induta: apicibus ad octantem anteriorem positis valdè involutis; latere antico dilatato, subgloboso; latere postico arcuato, coarctato, acuminato.

Shell fragile, falcate, subcylindrical, with a strongly marked angle from the beaks to the base of the posterior extremity; beaks at the anterior eighth of the length, strongly involute and leaving a deep depression in front of them. The anterior extremity is rounded, dilated, broader than high; the posterior end is arcuate and acuminate; against the beaks the valves are somewhat compressed; the arcuation is produced chiefly by the deflection of the superior margin, which is also rather sharp posteriorly. The substance of the shell is somewhat pearly when exposed by erosion,

and is covered by a thick chestnut colored epidermis, conspicuously corrugated at every part, in vertical wrinkles posteriorly, but in a somewhat divaricate manner anteriorly. The posterior superior portion gives rise to a byssoid fringe.

Length three inches; height and breadth half an inch.

Found in indurated marly clay. Monterey. *Maj. Rich.*

This species is so peculiar, and so entirely different from any other of the genus, as to require no comparison.

AVICULA STERNA (Pl. XVI. Fig. 7.)

Avicula sterna, Gould; Proc. B. S. N. H., Nov. 1851. IV. 93.

T. solidula, badia radiis pallidis ornata; epidermide cinereâ serratim fimbriatâ induta; apicibus ad quadrantem anteriorem positis; alâ semicirculari, modicè obliquâ; declivitate umbonali tumidâ, abruptâ; caudâ longissimâ, gracili; auriculis magnis, radiatim striatis; fissurâ byssali profundissimâ, acutangulari: margarita argentata, valdè iridescens; limbo fusco-marmorato.

Shell rather solid, obliquely ovate, triangular, with a very long, slender, acuminate cauda, and well marked auricles: color dark mahogany brown with a few paler radiations; surface compactly striate, covered with a thin, dirty, cinereous epidermis, very delicately fringed with radiating series of minute processes, especially in the vicinity of the byssal notch and at margin. Beaks near the anterior fourth, prominent, oblique, the posterior umbonal slope tumid, and in the left valve limited by an obtuse groove, a submarginal angle along the cauda; auricles radiately striate. Auricle of right valve trapezoidal, widening towards tip and obliquely truncate; byssal notch deep and acutangular; auricle of left valve subtriangular, as broad as long, the byssal fold prominent. Hinge with a well marked cardinal and lateral tooth in left valve; the cardinal tooth in right valve double. Cavity of beaks very decided. Nacre silvery and highly iridescent; cretaceous margin like tortoise shell.

Length of hinge margin two and a half inches; diameter of wing one and one fourth inches; breadth five eighths of an inch.

Inhabits Mazatlan? *Lieut. Green.* Panama. *Prof. Adams, Col. Jewett.*

Has the general appearance of *A. semi-sagitta*, but the wing is less oblique and curves directly into the cauda without any sinus;

the byssal sinus is deeper and much more acute, making a trapezoidal auricle. The cauda is much shorter in *A. tarentina* and the wing much more oblique. It most nearly resembles a Florida species, but in that the byssal angle is obtuse, the auricle triangular, and the cauda shorter.

LIMA TETRICA (Pl. XVI. Fig. 6.)

Lima tetrica, Gould; Proc. B. S. N. H., Nov. 1851. IV. 93.

T. obliquè ovato-triangularis, solida, albida, costis radiantibus ad 18, squamis semi-erectis posticis longioribus armatis horrescens; apicibus acutis, remotis, muriculatis; marginibus posticis et ventralibus continuis; margine antico rectilineari, hiante; areâ cardinali latâ, validâ; fovea ligamentalis minimè profunda, costâ transversali suffulta.

Shell obliquely ovate, triangular, solid, dirty white, with eighteen radiating ribs, covered with long semi-erect muricated scales, longest at the posterior margin; beaks acute, divaricate from each other, slightly auriculate, the margin of the wing forming a right angle with the posterior margin; posterior and ventral margins continuous; anterior margin rectilinear, inflected, so as to form a broad anterior face, with muriculate striæ, broadly gaping nearly half the length, the edges everted at the upper portion so as to form conspicuous nymphæ; hinge area broad and firm; ligament pit shallow, with a strong transverse rib below it. Interior shining, conspicuously indented by the ribs.

Length one and a half inches; height one and one eighth inches; breadth half an inch.

Inhabits La Paz, Gulf of California. *Maj. Rich.*

Compared with *L. squamosa*, it is narrower, and more compressed; the posterior and ventral margin is less broadly rounded; the scales are more crowded, twice as long, inflexed at their points, and much more decided at the dorsal margin; there are no transverse striæ on the dorsal area. The strong brace or rib in front of the ligament pit, by which a deep cavity is formed at the apex, is remarkable, but possibly accidental.

VENUS TANTILLUS (Pl. XV. Fig. 10.)

T. parva, ovato-trigona, ventricosa, inequilateralis, solidula; levis vel sulculis remotis concentricis arata, alba, posticè fusco tincta; margine dorsali antico recto, angulo ventrali rotundato; margine dorsali postico longiori, rectiusculo, angulo acuto.

Shell quite small, rather solid, ovate-trigonal, inequilateral; beaks acute, surface smooth or faintly waved with distant concentric furrows; the dorsal margins are nearly straight, and meet at the apex in a right angle, but the posterior side is a fourth longer than the anterior; the anterior basal angle is well rounded, while the posterior is acute; basal margin gently curved. Color white, but the posterior third is stained deep slaty blue outside and in, the line of demarcation being quite abrupt and well defined; there is also a pencil of the same color inside, running from the beak to the anterior cicatrix; the rest of the interior is cream colored.

Length one fourth of an inch; height one fifth of an inch.

Inhabits Santa Barbara. *Col. Jewett.*

This little Venus reminds one of *V. gemma*, for its minute size, but may more properly be regarded as a miniature of *V. meretrix* on account of its form and coloration. Its solidity, and the development of its hinge, mark it as an adult shell.

PURPURA PANSA.

Purpura patula is noted as inhabiting the West Indies, the Mediterranean, the Philippine Islands, the west coast of America, &c. Without being able to determine whether all these points are really localities for the shell received under this name, I have compared some of the specimens known to come from the west coast of America with some known to come from the Atlantic and Mediterranean, and find the following differences.

The Atlantic or Mediterranean shell is a large, solid, hemispherical shell, with blunt, moderately developed tubercles externally; interior well coated with enamel, white with a chestnut blotch within, and having the lip piceous, or dashed with that color; the left lip

is broad, with its edge whitish; its basal termination is broadly rounded.

The Pacific types are rarely more than one inch in length, elongated, more than half a cylinder; tubercles decidedly spinous; aperture rather contracted, thinly coated with enamel within and destitute of the chestnut blotch; left lip comparatively narrow, its edge barely a little paler, its basal termination acute and curving quite abruptly towards the canal.

These distinctions being constant, so far as I have seen specimens, would seem to be sufficient, together with their remote localities, to authorize a separation under the above name.

Among the rarer species contained in these California collections were *Venus aurantiaca*, Sowb., from Santa Barbara, supposed by Mr. Sowerby to belong to the Philippine Islands; *Venus gnidia*, Mazatlan; *Artemis gigantea*, La Paz; *Tellina regia*, Mazatlan; *Tellina Burneti*, Brod. L. California; *Parapholas Californica*, Conr. (P. Janellii, Desh.) S. Diego; *Periploma planiuscula*, Guaymas; *Thracia granulosa*, La Paz; *Anomia macrochisma*, Monterey; *Trochus Norrisii*, Santa Barbara; *Oniscia tuberculosa*, S. Juan; *Cassis coarctata*, S. Juan; *Saxidomus Nuttalli*, Conr. (Venerupis Petitii, Desh.) S. Diego; *Cancellaria obesa*, La Paz; *Cancellaria cassidiformis*, La Paz; *Cyrtulus distortus*, Panama; *Ostrea Cumingiana*, La Paz; *Pectunculus giganteus*, Guaymas; *Chiton Magdalenensis*, Mazatlan; *Chiton muscosus*, Gould (C. Collei, Reeve) Panama; *Chiton Stokesii*, Brod. S. Francisco; *Marginella imbricata*, Hinds. Santa Barbara; *Cerithum irroratum*, Gould, Mazatlan; *Saxicava Cordieri*, Desh. Mazatlan; *Tellina Bodegensis*, San Francisco; *Cardium elatum*, Brod. San Diego; *Sanguinolaria decora*, Hinds, San Diego.

LIST OF THE FIGURES.

Plate XIV.

Fig. 1. Bulimus vesicalis.
2. Bulimus vegetus.
3. Bulimus elatus.
4. Physa elata.
5. Acmæa paleacea.
7. Crepidula explanata.
8. Bulla (Akera) culcitella.
9. Bulla (Tornatina) cerealis.
10. Narica ovoidea.
11. Trochus marcidus.
12. Modulus dorsuosus.
13. Odostomia achates.
14. Odostomia gravida.
15. Chemnitzia tenuicula.
16. Chemnitzia torquata.
17. Sigaretus debilis.
18. Fusus ambustus.
19. Terebra arguta.
20. Erato leucophæa.
21. Conus ravus.
22. Conus pusillus.
23. Conus comptus.

Plate XV.

1. Pholas ovoidea.
2. Arthemis saccata.
3. Lucina orbella.
4. Mactra mendica.
5. Petricola bulbosa.
6. Osteodesma nitidum.
7. Lutraria undulata.
8. Donax flexuosus.
9. Donax obesus.
10. Venus tantillus.

Plate XVI.

1. Tellina miniata.
2. Tellina tersa.
3. Tellina pura.
4. Tellina (Strigilla) fucata.
5. Tellina gemma.
5 bis. Cyrena altilis.
6. Lima tetrica.
7. Avicula sterna.
8. Mytilus glomeratus.
9. Lithodomus falcatus.

J H. Richard del. Tappan & Bradford imp. A. Sonrel lith

MENOBRANCHUS PUNCTATUS.

C. J. WALLIS on Stone

O. J. WALLIS on Stone

O. J. WALLIS on Stone

BOSTON

JOURNAL OF NATURAL HISTORY.

VOLUME VI.—NO. IV.

Art. XXV.—*New Species of Fossil Plants, from the Anthracite and Bituminous Coal-fields of Pennsylvania; collected and described by* Leo Lesquereux. *With Introductory Observations by* Henry Darwin Rogers.

The following new species of fossil plants, one hundred and ten in number, are some of the results of a systematic investigation of the fossil flora of the carboniferous strata of Pennsylvania and the adjacent coal-fields of Ohio and Virginia, undertaken three years ago by my able assistant in this department of the geological survey of Pennsylvania, Leo Lesquereux, Esq., formerly of Switzerland, now of Columbus, Ohio.

By far the greater part of the specimens were collected by himself, and these are now in our possession. A few of the new species were first seen and studied by him in the rich local cabinets of Mr. Clarkson, of Carbondale, and of the Rev. W. Moore, of Greensburg, to whom our best thanks are due for their liberality in thus opening their collections for the description of what was new. Many of these hitherto undescribed forms were discovered in the slates, associated with the

beds of anthracite in the coal-fields of eastern Pennsylvania, which, compared with the bituminous coal-measures of western Pennsylvania, appear not only to contain a greater variety of species, but to present them in a condition of more perfect preservation for study.

The new species here briefly described by Mr. Lesquereux, constitute about one half of the total number of well-defined forms hitherto detected by him in the coal-measures and lower carboniferous rocks (the vespertine series) of Pennsylvania; more than one hundred of the two hundred and twenty species examined by him proving to be entirely identical with species already recognized in the European coal-fields, and some fifty more of them showing differences so slight, that a fuller comparison with better specimens, may result in their identification likewise. As a further evidence of the near affinity of the North American to the European fossil flora of the carboniferous age, he has remarked, in the course of his investigations, that even these new species which seem restricted to this continent, are every one of them in close relationship with European forms. It deserves mention, moreover, that the commonest European species are likewise the most common American ones.

A stratigraphical analysis of the anthracite measures of Pennsylvania, calls for their division into two groups, a lower series, distinguished by the *white* or very pale color of the ashes of nearly all the coal seams, and an upper series, including coals as remarkable for yielding only pinkish or red ashes. Between these groups there usually exists, especially in the southern or Pottsville basin, a small transition group of two or three beds of gray ash, or pinkish-gray ash coals. The entire number of coal-seams, of a thickness admitting mining, in the middle portion of the southern basin, where the whole formation is thickest and most replete in coal-beds, does not exceed about twenty-five; and counting those of all dimensions, the total series does not amount to more than from thirty to thirty-five separate layers.

In the bituminous coal-measures west of the Alleghany Mountains, the whole number of workable seams is less than one half of that above named, as belonging to the anthracite formation, while, including the thinner and less persistent beds, the entire series cannot there amount to more than eighteen or twenty. That portion of this great Appalachian coal-field, which lies within Ohio, appears to possess even somewhat fewer than the eastern half in Pennsylvania, the beds suitable for mining being estimated at seven, and the small seams about ten, in addition.

Advancing westward to the great coal basin of Indiana and Illinois, the coals thick enough for working are counted at only six, and the thin ones proportionately few; and this remarkable progressive reduction in the coal-beds, going westward, seems to be maintained as far as we advance in the formation; for crossing the Mississippi to the wide shallow coal-measures of Missouri and Iowa, the number of the workable beds there believed to exist, does not amount to more than three or four. Accompanying this interesting gradation in the amount of coal, there occurs an equally noteworthy diminution in the thickness and coarseness of the associated strata, showing a progressive thinning down of the whole of the land-derived coal-bearing portions of the carboniferous deposits. A future comparison of the fossil plants of these broad successive coal basins will probably disclose a corresponding reduction in the number and variety of the species, a view already suggested by their relative paucity in the bituminous coal-fields of western Pennsylvania and Ohio, as measured by their abundance in the anthracitic basins.

Wherever I have studied either of the anthracite fields, of the great Appalachian basin, I have remarked that the lower or "white ash" division of the coal-measures, gives indications of more violent and frequent disturbances of level in the surface, at the time of the deposition of the strata, than are noticeable in the composition of the upper or "red ash" part of the formation. Among the proofs are, more abrupt and

frequent alternations of coarse and fine deposits, more diversified and rapid changes in the thickness, composition, and arrangement of the strata, both of the mechanical deposits and the life-derived beds of coal, and the far greater mutability and inconstancy of all those strata, even the most quietly deposited, within the same area or extent of outcrop. The lower strata of the anthracite coal-measures are, indeed, remarkable for the diversity in the coarseness of the sandstone, and for the unsteadiness in thickness of the coal-beds themselves. Though these carbonaceous layers are the accumulations of once perfectly level sea-meadows, at successive depressions of the surface, it is evident, from their comparatively rapid thickening and thinning, and frequent coalescing and diverging, that the floors upon which they were collected were neither so wide as those which open the vegetation that resulted in the bituminous coal-beds, nor so uniform and gradual and horizontal in their slow movements of elevation and depression.

Commensurate with the more fluctuating size, and more restricted range of these lower coal-seams, is a greater inconstancy and diversity in their fossil flora. The more widely extended upper beds appear to exhibit a more limited specific vegetation, expanded over wider areas.

As far as our researches have gone, we notice that the lower strata, both in the anthracite measures, and in the great Appalachian coal-field, abound in the larger species, especially in Lepidodendra, while the higher seams are characterized by the smaller *herbaceous species*, most generally the herbaceous ferns.

We conceive that the large proportion of species common to the coal strata of North America and Europe clearly establishes identity of age between the two deposits, and a close accordance, if not identity, in the geographical and climatal conditions prevailing at their formation. A yet closer agreement is noticeable between the species found in the several coal-fields of the United States. Indeed, so alike are all the

anthracite basins in their fossils, that Mr. Lesquereux already recognizes more than twenty familiar European species as common to these once continuously united coal-fields. It has been indicated above, that the two different groups of the coal strata of Pennsylvania, the lower or white ash, and the upper or red ash, are characterized by somewhat different species, though these more or less intermingle. Satisfied of this fact, of a general prevalence of certain forms in certain parts of the coal-measures, we have aimed at carrying our inquiry a step farther, to ascertain whether or not any or all of the individual coal-seams themselves are separately recognizable by their fossil plants. Undoubtedly, in some of the broadly deposited and uniformly conditioned coal-beds and coal-slates of the western bituminous coal-fields, we do observe a most striking prevalence of the same species within the same layer, on comparatively wide areas; but amid the more irregularly accumulated beds, of especially the lower or white ash anthracite strata, formed on a less stable portion of the nowhere absolutely stationary crust, the inconstancy in the vegetation of even the same coal-seam is, for the most part, if not even quite, too great to permit us to attempt to identify it by its fossils merely. Again, in some instances, coal-beds which are demonstrably different, are almost absolutely identical in their fossils. This is the case with the "Gate" and "Salem" coals, near Pottsville. So strikingly alike are they in their vegetation, that Mr. Lesquereux strongly inclines to regard them as but the detached parts of originally one sheet of coal, and to suspect that there is some error of obscurity in my section, which shows them to be separated by several hundred feet of strata, including a number of beds of coal. Of the validity of the proofs, showing the so-called Salem vein, to be different coal from the Gate vein, and several stages higher in the series, there cannot, however, be any question, and the palæontological evidence for identity must give way before the higher and decisive demonstration from superposition, of their difference in age.

NEW SPECIES OF FOSSIL PLANTS,

BY LEO LESQUEREUX.

Genus CALAMITES. Brongt.

1. Calamites bistriatus (spec. nov.). Stem three inches broad, cylindrical; articulations about two inches distant; ribs broad, nearly plane, narrowly striate, converging at the articulations; tubercles very small and obsolete, inserted on the articulations.

2. Calamites disjunctus (spec. nov.). Stem cylindrical, one inch broad; articulations about two inches distant, inflated and crossed by a depressed furrow; ribs elevated, half cylindrical, exactly parallel, narrow; surface covered with small elevated points; tubercles very small, round.

Genus ASTEROPHYLLITES. Brongt.

3. Asterophyllites crassicaulis (spec. nov.). Stem thick, articulated; deeply striate; articulations half an inch distant; leaves verticillate on the joints, linear, acute, single nerved; tubercle or fruit obcordate, acute, attached to the stem in the axils of the leaves.

4. Asterophyllites ovalis (spec. nov.). Differs from the former by its slender stem, slender furrows, the leaves more numerous, and the tubercles oval.

5. Asterophyllites sublævis (spec. nov.). Stem thick, nearly smooth, slightly undulate above and below the inflated joints, branching at the articulations; leaves verticillate, half open, shorter than the distance between the joints; branches short and thick, with very short leaves.

6. Asterophyllites lanceolata (spec. nov.) (*Wolkmannia major Gutb.* ?). Differs from *A. tuberculata* (Lindl.) by the leaves united half their length, and terminated in a lanceolate point.

7. Asterophyllites aperta (spec. nov.). Stem scarcely

half an inch broad; articulations very near; leaves short, or obovate, united in their whole length; whorls half open, not appressed on the stem.

Genus ANNULARIA. Sternb.

8. Annularia sphenophylloides? Ung. Stem diffuse, articulated, marked with deep narrow furrows (narrowly striate); leaves verticillate, 10 to 16, flat, obovate, oblong, very entire, either slightly emarginate or pointed.

Genus SPHENOPHYLLUM. Brongt.

9. Sphenophyllum filiculme (spec. nov.). Stem very slender, threadlike; leaves in whorls of six; the lateral ones long, cuneate, deeply emarginate and crenulate; inferior leaves much shorter and scarcely broader, of the same form.

10. Sphenophyllum trifoliatum (spec. nov.). Stem thick, inflated at the joints, striate, leaves in whorls of three or four, deeply cut in three linear, acute divisions.

Genus NŒGGERATHIA. Sternb.

11. Nœggerathia obtusa (spec. nov.). Frond bipinnately branching; pinnæ elongated, slightly undulate, pinnules attached to the rachis in a very acute angle; broad and long, obovate, rounded and lobed above; narrowed below in a short, broad petiole; nerves dichotomous and simple, parallel, distinct.

12. Nœggerathia minor (spec. nov.). Frond bipinnately branching; pinnæ long and straight, half open; pinnules distant, small, obliquely attached to the rachis, and slightly recurved, cuneate, very obtuse above, narrowed below in a long petiole; nerves very slender, scarcely distinct.

13. Nœggerathia bockschiana Lesqx. (*Cyclopteris Bockschiana* Göpp). Frond bitripinnately branching; pinnæ trifo-

liate or pinnate; pinnules obliquely attached to the rachis, varying from the obovate and obcordate to the broadly cuneate form; narrowed into a short broad petiole; upper leaflet larger and broadly obovate, narrowed into a longer petiole; nerves either dichotomous or simple, distinct; stem thick, channelled, slightly margined like the branches.

Genus CYCLOPTERIS.

14. Cyclopteris fimbriata (spec. nov.). Leaves nearly round or truncate, unequally cordate at the base; margins, especially above, fringed with long, threadlike, linear, acute, flexuous, and nearly equal divisions; nerve, flabelli-form, furcate from the base; nearly straight, distant, though very thin, parallel, ascending to the point of the divisions or fringes.

15. Cyclopteris laciniata (spec. nov.). Leaves orbicular, quadrate; base equal and slightly cordate, irregularly fringed around by long, flexuous, acute divisions, somewhat unequal in length, and united in fascicles; nerves flabelliform, forking, straight, very close and distinct; surface covered with a coat of scales.

16. Cyclopteris undans (spec. nov.). Leaves broadly oval or nearly round, emarginate at the base, or irregularly cordate; margins undulate and irregularly toothed; nerves flabelliform, dichotomous, very slender and close, distinct, united in fascicles and thickened at and near the base.

17. Cyclopteris elegans (spec. nov.). Leaves nearly orbicular, (the lobes of the base converging and embracing the stem, and the point of attachment being nearly central,) entire or slightly undulate in outline; nerves very distinct, deeply marked, radiating and dichotomous from the base where they are thickened; arched.

18. Cyclopteris hirsuta Lesqx. (*Cyclopteris trichomanoides* Brongt. *in parte*). Leaves oval or round in outline, either symmetrical or unequally cordate, sometimes kidney-shaped, enlarged at the base, with equal or unequal, converg-

ing or diverging lobes; nerves very thin, flabellate or dichotomous from the base, very close and slender near the margin; surface more or less covered with short straight hairs.

Genus NEUROPTERIS.

19. Neuropteris speciosa (spec. nov.). Leaves oval, lanceolate, cordate at the base, 3 to 6 inches long, $1\frac{1}{2}$ to 2 inches broad; margins entire, nervules flabelliform, and dichotomous from a scarcely inflated medial nerve; distant, very slender and distinct; very arched downwards, and then turned upwards on the margins.

20. Neuropteris hirsuta Lesqx. *Neuropteris cordata* Brongt. *Neuropteris angustifolia* Brongt. *Neuropteris Scheuchzeri* Hoff. *Neuropteris acutifolia* Brongt? Frond pinnate or bipinnate; pinnules trifoliate except near the summit of the pinnæ, where they become simple; leaves cordate at the base, lanceolate, acute, or obtuse; sometimes irregularly lobed, strongly nerved, till above the middle; nervules dichotomous, very arched and close; leaflets of the base kidney shaped, round, oval, much smaller, with the nerves flabelliform from the base, without any medial nerve; surface of the leaves more or less covered with short straight hairs.

21. Neuropteris Clarksoni (spec. nov.). Stems irregularly bipinnately branching; pinnules simple, broadly lanceolate above; cordate or irregularly auriculate, and hastate at the base by the inferior lobe being more or less elongated; terminal pinnule lance shaped, equally bilobed in the middle; nervules dichotomous, distinct, strongly marked from a thick medial nerve, which ascends nearly to the summit.

22. Neuropteris fissa (spec. nov.). Frond? Pinnule oval, truncate at the base or cordate; margin undulate; nervules dichotomous from a medial nerve; very distant and slender, scarcely marked.

23. Neuropteris delicatula (spec. nov.). Frond bipin-

nate; pinnæ lanceolate, short, pinnules oblong, attached to the broad flattened rachis by their whole base and slightly decurrent, distinct; nervules distinct, flabellate, dichotomous, arched, thin, and close; rachis slightly winged, flexuous.

24. NEUROPTERIS GIBBOSA (spec. nov.). Frond bipinnate; pinnules opposite, nearly equally cordate at the base, oblong obtuse, with the margins deeply and irregularly sinuate; nervules flabellate, dichotomous, very slender, close and distinct.

25. NEUROPTERIS UNDANS (spec. nov.). Frond bipinnate; pinnules either large, two inches long and more, lanceolate, attenuate at the base, with the margins deeply undulate plaited, or small oblong undulate, with a very large (three times longer and broader) terminal lance-shaped, obtuse, undulate pinnule, lobate or angular below the middle; nerves flabellate, very arched, dichotomous, very thin and close on the margin; inflated at and near the base.

26. NEUROPTERIS TENUINERVIS (spec. nov.). Frond bipinnate; pinnules oval or oblong, with undulate margins, sometimes irregularly toothed at the summit; either regularly cordate at the base, or attenuated in a short broad petiole; nervules very thin, dichotomous from the base, slightly arched or straight, equal, not inflated below; medial nerve marked by a very thin exactly straight depression; rachis round and narrowly striate.

27. NEUROPTERIS DENTATA (spec. nov.). Frond pinnate; pinnules slightly cordate, at the base oval, lanceolate in outline, with the margins irregularly cut; toothed and lobed; nerves flabellate and dichotomous, deeply marked but very thin and close.

28. NEUROPTERIS DESORII (spec. nov.). Frond bipinnate; pinnules opposite, either oblong oval, or obovate, entire, or irregularly laciniate from the base, sometimes pinnately divided in long linear teeth; nerves flabellate, dichotomous, very thin above, thickened at the base.

29. NEUROPTERIS MINOR (spec. nov.). Frond bipinnate;

pinnæ short, linear, sessile on a thick, striate, round rachis, pinnatifid; pinnules oval, sessile, either separate or united in the upper part of the pinnæ; terminal leaflet very small, oval; nerves thick, obsolete, bifurcate.

30. Neuropteris Moorii (spec. nov.). Frond bipinnate; pinnæ nearly opposite, half open; pinnules alternate, ovate, slightly acute, entire, sessile by their whole base, and somewhat contiguous; nervules emerging either from the medial nerve or from the rachis, furcate; primary rachis thick, smooth, winged by some pinnules of the same form attached to it.

31. Neuropteris adiantites (spec. nov.). Frond bipinnate; pinnules nearly decurrent on a slender rachis, oval, obtuse; inferior pinnules decurrent on the primary rachis; nervules dichotomous, distinct.

Genus ODONTOPTERIS. Brongt.

32. Odontopteris squamosa (spec. nov.). Frond tripinnate; pinnæ long, linear-lanceolate; pinnules oblong, oval, obtuse, the terminal one smaller, oval-lanceolate, acute; nervules thin, but very distinct, dichotomous, straight, parallel; surface of the leaflets ordinarily covered with a coat of scales?

33. Odontopteris dubia (spec. nov.). Frond? Pinnule oval-lanceolate, entire on one side, cut on the other in three lobes; nervules slender, dichotomous, straight from a medial nerve. (An species propria); perhaps only a leaflet of Odontopteris Sternbergii Göpp.

Genus SPHENOPTERIS. Brongt.

34. Sphenopteris abbreviata (spec. nov.). Frond bipinnate; pinnæ alternate, open, short, linear-lanceolate; pinnules alternate, sessile by the whole base, distinct, obliquely ovate in outline, crenulate; nerves pinnately forking, distinct.

35. Sphenopteris intermedia (spec. nov.). Frond tripinnatifid; rachis smooth and slender, slightly striate; second-

ary pinnæ linear lanceolate, deeply pinnatifid; pinnules small, oval, decurrent, joined together by their base, serrulate at the summit; nerves obsolete, pinnately forked; nervules simple.

36. Sphenopteris flagellaris (spec. nov.). Frond bipinnatifid; pinnæ long, linear, flexuous, slender; pinnules alternate, oval, with a broad decurrent base, united together, crenulate; nerves bifurcate.

37. Sphenopteris plicata (spec. nov.). Frond bipinnatifid? pinnæ long, linear-lanceolate; pinnules distant, very open, oval, oblong, enlarged below, sessile on the winged rachis, and united together; pinnately lobate, and undulate plaited; medial nerves thick; nervules obsolete.

38. Sphenopteris glandulosa (spec. nov.). Frond tripinnately divided, forked above; primary and secondary pinnæ opposite, long, perpendicular or recurved on the broad striate rachis; inferior pinnules equally three to five lobate, cordate at the base, lobed round; terminal leaflet acute, and sometimes long pointed by the persistence of the broad medial nerve; superior pinnules smaller round, entire; texture thick, convex, glandular, punctulate, rough; nervules entirely obsolete.

39. Sphenopteris decipiens (spec. nov.). Frond pinnate; pinnules elongated, pinnately lobed, lobes half round, very obtuse, decurrent, and united from the middle; the terminal broader; nerves undulate, broad; nervules inclined on the rachis, two to three times forked.

40. Sphenopteris Newberryi (spec. nov.). Stem forking above in a very obtuse angle; frond bipinnate; secondary pinnæ from one to two inches long, linear-lanceolate, acute, pinnately lobed; inferior pinnules sessile by their whole base, but distinct, irregularly undulate, lobed; superior ones confluent, ovate, lanceolate, entire or scarcely undulate; terminal small and pointed; nerves obsolete.

41. Sphenopteris squamosa (spec. nov.). Frond tripinnatifid; secondary pinnæ linear, $1\frac{1}{2}$ inch long, obtuse; pinnules nearly square or half round, very entire, sessile, the

superior ones confluent; terminal leaflet large, rounded or lobate, angular, obtuse; nerves entirely obsolete; surface covered with small shining scales?

Genus HYMENOPHYLLITES. Göpp.

42. Hymenophyllites furcatus? Göpp. Frond tripinnatifid; common rachis subulate, with its divisions nearly perpendicular; pinnules oblique, deeply pinnatifid; lobes bitrifid; the inferior ones nearly pinnately divided, with the divisions linear, lanceolate, oblique, plain, and slightly acute or truncate. It differs by the divisions being slightly truncate, (an species propria).

43. Hymenophyllites Hildreti (spec. nov.). Frond bipinnate; secondary pinnæ lanceolate, open, alternate, the inferior bipinnately, the superior pinnately divided; divisions linear, acute.

44. Hymenophyllites capillaris (spec. nov.). Differs from the former by its very narrow and longer divisions.

Genus PACHYPHYLLUM. Lesqx.

Frond large, thick, membranaceous, broadly oval or lanceolate in outline, either pinnately or irregularly lobed; radical or borne on a thick rachis? divisions short, lanceolate, obtuse, or long linear-flexuous; nerves thick, compound and parallel near the base, separating above and solitary in each division, or disappearing totally.

45. Pachyphyllum fimbriatum (spec. nov.). Frond large, pinnate; pinnules sessile, distant, oblique, pinnately divided; divisions lanceolate, acute, short, fringed on the slightly recurved margins; nerves pinnately branching; nervules simple in each division.

46. Pachyphyllum affine (spec. nov.). Differs from the former only by the flattened and entirely smooth margins of the divisions.

47. Pachyphyllum hirsutum (spec. nov.). Frond bipin-

nately divided, dichotomous, pinnæ decurrent, divisions short, oval, acute; nerves obsolete; surface and margins covered with long glandular hairs.

48. Pachyphyllum laceratum (spec. nov.). Like the former, but smooth, and with the divisions undulate and unequally toothed.

49. Pachyphyllum lactuca, Lesqx. *Schizopteris lactuca* Sternb. Frond pinnate; pinnæ lanceolate or broadly oval in outline, pinnatifid; lobes lanceolate, pinnately divided; divisions linear, obtuse; nerves obliterate, parallel, and fasciculate below; simple in each division.

Genus ASPLENITES. Göpp.

50. Asplenites rubra (nov. spec.). Frond bipinnate, (or tripinnate?); pinnæ broadly linear, half open, alternate; pinnules oval, oblong, united at the base; medial nerve strong; nervules forking once near the base; fruit dots linear, placed in two rows between the margin and the medial nerve; rachis thick, not inflated.

Genus ALETHOPTERIS. Sternb. and Göpp.

51. Alethopteris Pennsylvanica (spec. nov.). Inferior pinnæ bipinnatifid, with short, round pinnules, united half their length; superior pinnæ, pinnate only, with long lanceolate, linear, and undulate pinnules, slightly decurrent on the rachis and united at the base; medial nerve broad, canaliculate; nervules perpendicular, slender, close, simple, or dichotomous.

52. Alethopteris distans (spec. nov.). Frond bipinnatifid; pinnæ open, linear-lanceolate; pinnules alternate, linear, narrow, very distant, pinnately crenulate, enlarged at the base; united only in the upper part of the terminal pinnæ, where they become broader, shorter, and obtuse; secondary nerves obsolete.

53. Alethopteris obscura (spec. nov.). Frond bipin-

natifid; pinnæ pinnatifid above; pinnules lanceolate, one inch long, enlarged at the base; united together and decurrent above, distinct below; deeply undulate on the margins; secondary nerves obsolete, very slender and oblique; bifurcate, slightly arched.

54. ALETHOPTERIS SERRULA (spec. nov.). Frond pinnatifid, large; pinnules alternate sessile, perpendicular to the rachis or inclined backwards, straight, linear, four inches long and more, pinnately lobed; lobes alternate, two to three times toothed, sometimes entire and obtuse; secondary nerves once or twice forking.

55. ALETHOPTERIS LÆVIS (spec. nov ?). Differs from Alethopteris nervosa only by its shorter pinnules and entirely smooth surface, without any trace of nerves; (an species propria.)

GENUS CALLIPTERIS. Brongt.

56. CALLIPTERIS SULLIVANTII (spec. nov.). Frond bipinnate; pinnæ lanceolate; pinnules alternate, oblique, obovate or oblong, nearly contiguous, slightly decurrent, and united together near the base by a slightly obtuse sinus; medial nerve broad, canaliculate, disappearing at the middle; secondary nerves arched, slender, close, many times forking.

GENUS PECOPTERIS. Brongt.

57. PECOPTERIS DISTANS (spec. nov.). Has the nervation of *Pecopteris polymorpha;* differs from it by its distant pinnules, oval, lanceolate, narrowed at the base, and attached to the rachis only by the thickened medial nerve.

58. PECOPTERIS VELUTINA (spec. nov.). Frond bipinnatifid; lower pinnæ perpendicular to the rachis, pinnate, broadly linear-lanceolate; 1½ to 2 inches long; pinnules distinct, slightly contracted in the middle, and enlarged above the base, sessile, united only at the summit of the pinnæ; upper pinnæ simple, pinnately undulate, lobed, or entire;

nerves obsolete, surface covered with short appressed hairs; fruit dots placed only at the upper part of the pinnules, few, two ranked, large, oval.

59. Pecopteris notata (spec. nov.). Frond tripinnate; secondary pinnæ horizontal, short, linear-lanceolate, obtuse; pinnules short, oval, or half round, united nearly to the middle; terminal leaflet large, oval, obtuse; nervules strongly marked, forking once, attached at an acute angle to the undulate medial nerve, rachis striate; fruit dots very small, punctiform, irregularly placed along the nervules and between their branches.

60. Pecopteris pusilla (spec. nov.). Frond bipinnate; pinnæ oblique, linear, nearly decurrent on a broad, flexuous, and winged smooth rachis; pinnules very small, united above the middle, oval, hairy, the lowest a little larger; nervules simple, obsolete.

61. Pecopteris concinna (spec. nov.). Frond bipinnate; pinnæ open, with an undulate rachis; pinnules about one inch long, oval, lanceolate, narrowed at the base and sessile, distant and perpendicular to the rachis, pinnately undulate, lobed; medial nerve undulate; secondary nerves pinnately forking three or four times in each lobe; nervules simple.

62. Pecopteris decurrens (spec. nov.). Frond bipinnate; pinnæ opposite, superior ones terminal by the forking of the rachis; pinnules distant, oval, oblong, obtuse, entire, contracted above the base on the upper side, dilated on the lower, and decurrent on the broadly winged rachis; medial nerve undulate, scarcely broader than the lateral ones which are simple, or once forked, arched; primary rachis flattened, broad, enlarged at the articulations of the pinnæ.

63. Pecopteris incompleta (spec. nov.). Frond bipinnatifid; pinnæ very oblique, scarcely open, lanceolate; pinnules oval, or nearly round, decurrent, united at the base, very oblique; the superior one very small, and the terminal wanting by the elongation of the secondary rachis pointing

above the leaflets; medial nerve strong at the base; nervules once forking.

Genus CREMATOPTERIS. W. P. Schimper.

64. Crematopteris? pennsylvanica (spec. nov.). Rachis very thick, round, nearly smooth, or irregularly striate; pinnules short, linear oval, distant, sessile on the broad rachis, slightly attenuated at the base; nerves entirely obsolete or none.

Genus SCOLOPENDRITES. Lesqx.

Frond simple, lanceolate, large, deeply, irregularly toothed; medial nerves very slender; nervules thin, pinnately branching from the medial nerve, nearly straight and scarcely arched, undulate, very distant, one eighth of an inch and more, forking twice.

65. Scolopendrites grosse-dentata (spec. nov.). Specific characters the same as above.

Genus CAULOPTERIS. Lindl. and Hutt.

66. Caulopteris punctata (spec. nov.). Scars oval obtuse, about two inches long, distant, with a broad smooth margin; fascicle of vessels simple, oval, curved above in two converging horns; intervals between the scars *dotted* with the base of small rootlets?

67. Caulopteris gigantea (spec. nov.). Differs from the former by the large size of the scars, its entirely smooth surface, and the divergence of the horns.

Genus STIGMARIA.

68. Stigmaria costata (spec. nov.). Like Stigmaria anabathra; differs by the nearly regular, strong and elevated ribs which separate the rows of scars placed in a regular, nearly spiral order.

69. Stigmaria umbonata (spec. nov.). Differs from Stigmaria ficoides by the scars, which are at least twice as broad, elevated, and with a single ring at the border.

70. Stigmaria irregularis (spec. nov.). Stem deeply and narrowly ribbed in its length; scars distant and scarce, oval, sometimes acute at both ends, sometimes round, placed without order.

71. Stigmaria radicans (spec. nov.). Stem about two inches broad, narrowly striate in its length, scars irregular and irregularly placed; rootlets apparently round and narrowed near the base.

72. Stigmaria minuta (spec. nov.). Stem thick, lower scars very small and close to each other, placed in a spiral order, round; the superior ones more distant, oval, pointed or open in their inferior part, central scars elongated, like a deep narrow line, dividing the general scars.

Genus SIGILLARIA.

73. Sigillaria sculpta (spec. nov.). Stem irregularly and narrowly striate in its length, without ribs; striæ undulate; scars elevated, smooth, about an inch and a half distant, quadrangular-rhomboidal oblique, emarginate, cordate above, with the three other angles acute; vascular scars three, the medial one oval, crosswise; the lateral ones linear arched.

74. Sigillaria fissa (spec. nov.). Surface striate in its length by narrow, undulate, smooth lines; without ribs; scars about one inch distant, cordate, obtuse in outline, deeply emarginate above, round obtuse below, with two acute angles at both sides, and a single oval, vascular scar, attached in the middle of a semilunar or arched ring.

75. Sigillaria dilatata (spec. nov.). Surface marked with undulate, smooth, very narrow striæ without ribs; scars one eighth of an inch distant, plane, enlarged on the sides, being nearly twice as broad as high; emarginate, cordate above, very obtuse below; lateral angles very acute; vascular scars three, the medial one broadly oval, crosswise; the lat-

eral ones linear arched. In its corticated state, the whole surface is narrowly undulate striate, the striæ diverging only above the vascular scars which are oval; the two exterior ones, in the length, the central one crosswise.

76. Sigillaria Schimperi (spec. nov.). Surface undulate, narrowly plaited and striate crosswise. Scars one inch distant, large, striate in the same direction as the intervals, nearly round in outline; the upper marginal line well marked, half circular, and extending horizontally on both sides; the inferior one slightly marked, half circular. Vascular scars two, oval, placed below an arched, linear depression.

77. Sigillaria stellata (spec. nov.). Surface deeply marked with undulate, branching wrinkles, diverging in every direction from the smooth scars around them. Scars nearly plane, regularly hexagonal, the upper side only obtusely emarginate. Vascular scars three; the medial one semilunar, the lateral ones oval-pointed downwards and diverging to the sides.

78. Sigillaria polita (spec. nov.). Stem ribbed, ribs nearly plane, very smooth, as broad as the distance between the scars; furrows narrow, deep, and straight; scars discoid, enlarged both sides, round above, the lower margin convex, with two lateral angles very obtuse. Vascular scars three; the medial one transversal linear, straight in the middle and convex at both ends; the lateral ones linear, arched.

79. Sigillaria dubia (spec. nov.). Like Sigillaria Cortei Brongt; differs by the greater distance of the scars, which are broader at the base, and by the ribs being more deeply striate.

80. Sigillaria obovata (spec. nov.). Stem ribbed; ribs more than one inch broad, nearly flat, obsoletely striate; furrows deep and narrow; scars obovate, with the inferior margin very obtuse. Vascular scars three; the medial one linear, short, the lateral ones slightly arched.

81. Sigillaria discoidea (spec. nov.). Stems furrowed; furrows distant, irregular, deeply marked, and wrinkled; dis-

tance between them from two to three inches, flattened, irregularly dotted. Scars elevated, half globular, diminishing in size, slightly emarginate below, close to each other, marked in the middle by a deep, irregular point.

Genus LEPIDODENDRON. Sternb.

82. Lepidodendron modulatum (spec. nov.). Scars oval, narrowed and acuminate at both ends, curved at the base, separated by a margin one eighth of an inch broad, half round, elevated, and deeply wrinkled; wrinkles undulate and parallel to the scars. Vascular scars rhomboidal, obtuse, arched above, narrowed below in a long point, acute at both sides, marked with three transversal points, united by a depressed line; tubercles narrow, medial line deeply transversely furrowed; appendages double.

83. Lepidodendron giganteum (spec. nov.). General scars oval-trapezoid, elongated-acute at both ends. Vascular scars placed nearly in the middle, rhomboidal-quadrangular, transversely marked with three points; appendages irregular, longer on one side, tubercles very small, oval; medial line marked in the whole length of the general scars, smooth.

84. Lepidodendron vestitum (spec. nov.). General scars oval-trapezoid, acute at both ends, separated by an irregular, elevated smooth margin, covering the borders of the scars; vascular scars quadrangular, trapezoid, placed at the summit of the general scars; three-pointed in the middle, appendages none; tubercles large, oval, diverging; medial line deep and smooth.

85. Lepidodendron conicum (spec. nov.). General scars oval, acute and narrowed at both ends; vascular scars triangular, conical, with a single oval point in the middle and two broad oval tubercles below; appendages none; medial line marked only by a row of undulate wrinkles, margins flat, one eighth of an inch broad, very wrinkled.

86. Lepidodendron oculatum (spec. nov.). Scars oval,

acuminate both ends, one third of an inch distant; vascular scars marked only in the superior arched outline, perpendicularly crossed by a straight line, like an arrow on a bow; tubercles very large, oval, medial line deeply furrowed, obsolete; intervals flat, undulately striate.

87. Lepidodendron distans (spec. nov.). Scars oval, lengthened, acuminate at both ends, half an inch distant, with the intervals undulately striate, flat; vascular scars rhomboidal, square, three-pointed; appendages double; tubercles small, diverging; medial line deep, transversely cut by broad short furrows.

88. Lepidodendron obtusum (spec. nov.). Scars trapezoid, acutely pointed above, slightly narrowed and abruptly obtuse below. Vascular scars nearly in the middle, rhomboidal, obtuse above, acute below, angular both sides, transversely three-pointed; appendages irregular, distinct on one side only; tubercles oval, diverging; medial line wrinkled, margins one eighth of an inch broad, undulately striate and furrowed in their length.

89. Lepidodendron carinatum (spec. nov.). Scars oval-hexagonal, angular, lengthened acute at both ends, with narrow keeled, smooth margins; vascular scars rhomboidal, obtuse above; triangular below; appendages short, obsolete, tubercles small oval, medial line obsolete, transversely furrowed.

90. Lepidodendron clypeatum (spec. nov.). Scars irregularly trapezoid, acute at both ends, obtuse on the sides, with narrow linear margins; vascular scars large, obtuse above and below, enlarged and acute on both sides, transversely three-pointed; appendages obsolete, converging on the very obsolete medial nerve, tubercles obsolete on one side, oval.

91. Lepidodendron sigillarioides (spec. nov.). Scars exactly trapezoid, with the acute angles at both ends; margins narrow, linear, smooth; vascular scars dilated, acute on both sides, transversely marked with three points, without any appendages, nor medial lines nor tubercles.

GENUS LEPIDOPHYLLUM. Brongt.

92. LEPIDOPHYLLUM ACUMINATUM (spec. nov.). Blade nearly one inch broad, three inches long, slightly narrowed near the base, acuminate, binerved.

93. LEPIDOPHYLLUM OBTUSUM (spec. nov.). Blade three fourths of an inch broad, four inches long and more, linear, abruptly terminated in a short point, marked in the middle by a broad, obsolete, inflated nerve.

94. LEPIDOPHYLLUM AFFINE (spec. nov.). Differs from Lepidophyllum lanceolatum by its obtuse blade and its long, pointed sporange.

95. LEPIDOPHYLLUM HASTATUM (spec. nov.). Sporange long, pointed; blade one inch long, enlarged at the base in two diverging auricles, hastate, slightly acute with a strong nerve.

96. LEPIDOPHYLLUM BREVIFOLIUM (spec. nov.). Sporange narrowed in a long point; blade very short, enlarged at the slightly obtuse sides.

97. LEPIDOPHYLLUM PLICATUM (spec. nov.). Blade linear, lanceolate obtuse, narrowed at the base, curved (geniculate) in the middle, nerved from the base to half its length; sporange ?

GENUS BRACHYPHYLLUM? Brongt.

98. BRACHYPHYLLUM OBTUSUM (spec. nov.). Leaves or scales imbricated, narrowed below like the sporange of Lepidophyllum; rounded above, marked in the middle by an elevated line resembling a nerve.

GENUS CARDIOCARPON. Brongt.

99. CARDIOCARPON TREVORTONI (spec. nov.). Capsule plane, nearly orbicular; emarginate, cordiform on one side, pointed on the other, marked in the middle by a sharp elevated line, very smooth.

100. Cardiocarpon plicatum (spec. nov.). Differs from the former by its undulate-plaited surface without medial line.

101. Cardiocarpon punctatum ? Göpp. Our species differs only by having a surface slightly concave and by points irregularly placed.

Genus TRIGONOCARPUM. Brongt.

102. Trigonocarpum Hildreti (spec. nov.). Fruit oval oblong, narrowly three ribbed, with the intervals finely striate.

Genus RHABDOCARPUS. Göpp. and Berg.

103. Rhabdocarpus venosus Lesqx. *Carpolithes venosus.* Sternb.

Genus CARPOLITHES. Sternb.

104. Carpolithes bifidus (spec. nov.). Fruit apparently pedicellate, oval oblong, arched, split in two parts above, three ribbed near the base ; pedicel thick ribbed.

105. Carpolithes disjunctus (spec. nov.). Fruit oval-lanceolate, slightly obtuse, divided in two parts, the superior one convex, the inferior concave, diverging from the other.

106. Carpolithes platimarginatus (spec. nov.). Fruit oval-acute, convex, smooth, broadly margined ; margin flat, broader near the point, disappearing above.

Genus PINNULARIA.

New species enumerated without description.

107. Pinnularia calamitarum (spec. nov.).

108. Pinnularia pinnata (spec. nov.).

109. Pinnularia fucoides (spec. nov.).

110. Pinnularia horizontalis (spec. nov.).

111. Pinnularia confervoides (spec. nov.).

ART. XXVI.—*Observations on the Development of* ANABLEPS GRONOVII, *(Cuv. & Val.)* By JEFFRIES WYMAN, M. D. Read Sept. 20th, 1854.

WHILE the general plan of the development of Fishes and Batrachian Reptiles conforms strictly to the an-allantoidian type, the external conditions under which the process of the formation of the embryo is carried on, vary to a very remarkable degree. In the larger majority of instances, eggs are scattered without care, or perhaps only a locality is selected which furnishes the most favorable circumstances, in relation to currents of water, the kind of bottom, the exposure to light, &c. Once deposited, they are no longer attended to.

In other cases, but these are comparatively few, the fishes construct something which serves to protect the eggs, and in a measure answers the purpose of a nest; in this the eggs are laid and undergo their evolution. The Lamprey builds a rude structure, consisting of a pile of stones brought from a distance, in the mouth; both sexes coöperating in the labor of building. The eggs are deposited between the stones as the structure is reared, and remain there in security until hatched. The Chub (*Catostomus tuberculatus*) has a similar habit. Our common Bream (*Pomotis vulgaris*,) and a species of *Gobius* found in the Mediterrânean, (the *Phycis* of Aristotle,)* both construct a true nest, composed of aquatic plants, in which the ova are developed, one or the other of the parents standing guard as the embryo passes through its different stages. But the most remarkable nests built by fishes, are those of the "Hassars" (*Collicthys*) of Demarara, and of the "Sticklebacks" (*Gasterostei*) of Europe. The "Round-headed Hassar" forms its nest of leaves, and the "Flat-headed Hassar" of grass. Of the two species of Stickleback described by Coste,†

* Owen. Lects. on Comp. Anat. Vol. II. p. 304.

† Instructions Pratiques sur la Pisciculture, suivies de Memoires, et de Rapports sur la même sujet. Par M. Coste, Professeur au Collége de France. Paris, 1853.

one forms a nest upon the bottom with pieces of grass and other vegetable substances, which are woven together, forming a covered structure, with two openings, so that when the fish enters it can pass through without being required to turn round to come out. If the materials prove too light, and show a tendency to float, they are loaded with stones till the nest is securely anchored.*

The other species constructs its abode upon some aquatic plant elevated above the bottom, or upon some submerged branch or twig of a tree. During incubation, the ova are guarded by the male, and protected against the depredations of the females, which are always ready to devour the eggs almost as soon as deposited.†

In another group of fishes, the eggs are neither scattered upon the bottom nor deposited in nests, but assume a more intimate relation with the parent, though still conforming to the oviparous mode. In the Pipe fishes they are attached to the body of one of the parents. In one species, *Syngnathus ophiodon*, the eggs merely adhere to the under side of the abdomen of the male, where they remain till hatched. But in *S. acus*, as observed by Ekströem and others, and in *S. Peckii*, as observed by Storer and myself, there is found a true marsupial pouch, consisting of two folds of skin, posterior to the anal opening of the male. These folds are directed inwards, and meet on the median line. In this pouch the eggs are deposited by the female, and remain there till incubation is complete, and even after the eggs are hatched the young return to the pouch as a place of refuge.

In all of the preceding instances the fœtus is developed exterior to or upon the surface of the body. The Pipe-fishes, which are analogous to the Marsupials among Mammals, form

* For a very interesting account of the nest-building of the Sticklebacks, see Hancock Ann. & Mag. of Nat. Hist. Vol. X. N. S. p. 241.

† I have witnessed this habit in a pregnant female which was in my possession. The eggs were deposited during the night, but on the following morning nothing remained of their contents, the empty envelopes being scattered about the bottom of the vessel.

a transition to the next division, where the conditions of development are wholly changed.

Extended observations have proved, that a large number of species of fishes, belonging to many genera, are truly viviparous, the fœtus passing through a real gestation by the parent before its development is complete. These Viviparous fishes may be divided into two groups, according to the position occupied by the embryo during the period of its growth.

I. In the first group may be arranged those fishes in which *the ovum leaves the ovary in an undeveloped state, and in which the process of eolution is not commenced until it reaches the lower portion of the oviduct.* The species which this group comprises are nearly all, if not all, Plagiostomes. The best known are *Spinax, Carcharias, Mustellus, Galeus,* and *Torpedo.* Although they are usually classified among the lowest of fishes, it is in some of them that the process of reproduction becomes most nearly analogous to that of the highest Vertebrates. Not only does the yelk reach proportions like those of the yelk of birds, but the yelk-sac itself plays the part of an allantois, and forms an organ analogous to a placenta. In Spinax, the vessels on the surface of the vitelline sac are brought in close contact with the highly vascular folds which line the oviducts. But in Carcharias, as Müller has demonstrated in his Memoir on the subject, not only is there an approximation of the fœtal and maternal vessels, but the surfaces of the yelk-sac and of the oviduct are both deeply convoluted, and the projections of the one are admitted into and embraced by the concavities of the other, and the opposing surfaces become adherent even. In both Spinax and Carcharias, the necessary conditions exist for the reaction of maternal and fœtal blood upon each other, as is the case in the Mammalia, but to a much more limited extent.*

* Dr. John Davy has shown, that in Torpedo the embryo is nourished at the expense of materials furnished by the parent, since the mature fœtus weighs more than twice as much as the egg at the time development commenced. *Philos. Trans.* 1834. *On the development of the Torpedo.*

II. In the second group those fishes are comprised in which *the gestation is either wholly or in part ovarian,* the last stages only of the process usually occurring in the oviduct. Among the genera included in this division are, *Silurus,** *Blennius,*† *Anableps,*‡ *Pœcilia,*§ and *Embiotoca.*‖ In all of these genera impregnation takes place in the ovary, and, as seems probable, while the ovum is still invested with its original envelopes. In Blenny, Rathké has shown, the ovarian gestation having continued about three weeks, that about the end of September the sac ruptures, and that the embryo is discharged into the central cavity of the ovary, which is in fact the oviduct; here the fœtus remains till the beginning of January, when it is born. In Pœcilia the fœtus is liberated and escapes into the oviduct towards the end of gestation. Valenciennes has given several details in relation to the development of *Anableps Gronovii,* made for the most part upon specimens in an advanced stage of fœtation, the smallest embryo being more than an inch long. He found only seven or eight fœtuses in the so-called uterus of each female, and each of the young was surrounded by a distinct sac, which he regards as simply an enlargement of the original envelope of the ovum. The mature foetus he found to be more than one fourth as long as the parent, and except for the non-development of the ovary, was constituted in every respect like the adult, as regards both its internal and external structure.

For the specimens of *Anableps Gronovii,* upon which the following observations were made, I am indebted to the liberality of Dr. Francis W. Cragin, United States Consul at Paramaribo, in Surinam. Among them were three males and five females, four of which last were in different stages of gestation. The different individuals varied from three and a

* Cuvier et Valenciennes Hist. Nat. des Poissons, T. i. p. 540. 1828.

† Rathké, Mem. sur la Develop. de l'Homme et des Animaux, 2me partie. Leipsic, 1833.

‡ Cuv. and Valenciennes, Hist. Nat. des. Poiss. T. xviii. p. 245. Paris, 1846.

§ Duvernoy, Ann. des Sc. Nat. T. I. N. S. p. 313. 1844.

‖ Agassiz, Am. Journal of Science. Vol. XVI. Second Series, Nov. 1853.

half to nine and a half inches in length, the females being much longer than the males.

I. The smallest female measured three and a half inches in length, but on careful examination no traces of an ovary were discovered; its development did not appear to have commenced as yet.

II. The next specimen measured seven inches in length, and the ovary was in a state of gestation; the fœtuses, four or five in number, measured but five-eighths of an inch. The ovary appeared single externally; was invested with peritoneum, which was supported by a more firm but thin membrane of condensed areolar tissue; on cutting through this, the interior was found filled with sacs corresponding in number to the fœtuses, and united to each other and the ovarian walls by a very loose areolar tissue. They had no communication of any kind with each other. With the aid of the point of a needle the sacs were easily detached and removed entire with the inclosed fœtus; the envelope was much larger than was necessary to hold the embryo, and the space between the two was filled with a fluid, a portion of which (albumen?) had been coagulated by the action of the alcohol. In each instance it was ascertained that the young had no connection whatever, vascular or otherwise, with the walls of the sac which inclosed it.

The external characters of the embryo, (Pl. 17, Fig. 5,) even at this early stage, as regards its general form and the fins, resemble those of the adult; but no longitudinal black bands were yet visible on the sides; the eye had not acquired the prominence of the adult, the cornea was not divided by a transverse band, and the pupil existed in the form of an oval, with its long diameter in a vertical direction, but the sides of the iris had just commenced extending towards the centre in order to form the two laminæ, which, in the adult, give the pupil its singular shape. The umbilical sac forms a spheroidal mass about one fourth of an inch in diameter, and is sufficiently transparent to allow the folds of the intestine which fill

it, to be visible. Externally, the sac is covered with what appear to be parallel projecting lines, extending from the sides of the abdomen to its most prominent part (Figs. 6 & 8.) These Valenciennes describes as "vascular striæ," (*stries vasculiformes.**) Such was not the nature of these markings in the specimens which I examined; but, when placed under the microscope, were found to form a peculiar structure, which possibly may have some connection with the process of nutrition in their peculiar method of gestation.

The sac itself seemed nearly homogeneous in structure, but the striæ are made up of spherical, or in some cases, pyriform or cylindrical, papillæ or villi, (Fig. 8,) projecting from the surface, and arranged so nearly together in a linear series as to give the appearance of a continuous band. In regard to the minute structure of these papillæ, as far as it could be determined from an alcoholic specimen, they consist externally of an exceedingly thin membrane, inclosing a vast number of minute granules; no vessels were seen in connection with them nor in the membrane to which they were attached. There was no appearance of any communication between the cavity of the papilla and that of the membrane to which it was attached. Within the latter, but more nearly in contact with the intestines, there was a second more delicate membrane, which seemed to be a continuation of the parietal peritoneum. No traces of the yelk were found in connection with the intestines.

III. The third specimen is much longer and measures ten inches in length; the ovary had been ruptured, so that some of the fœtuses had escaped into the cavity of the abdomen, but the whole number of young taken from the parent was much greater than in the preceding case, namely, eighteen; one of these was projecting from the genital opening. They generally resembled the preceding except in size, though the eyes had become more prominent (Fig. 6,) and the iris now

* Op. cit. ex fol. de planche, 539.

exhibited its lateral projections sufficiently developed to give the pupil the shape of a dumb-bell. The umbilical sac has become much larger than in the embryos first described, and measures three eighths of an inch in diameter. The papillæ of the yelk-sac are much more distinct and contain colored granules. The yelk-sac communicates with the cavity of the abdomen by a long fissure extending from a point just behind the union of the opercula nearly as far as the anal opening, consequently beyond the ventral fins. It is from the circumstance just mentioned, doubtless, that an explanation is to be found of the non-union of the ventrals in the adult. The scales terminate abruptly at the edge of the fissure. The intestines, as in the first described embryos, were invested by the internal sac, which was regarded as parietal peritoneum. No bands were visible on the flanks of the body nor were the anal fins yet modified to mark the sexes. A rudimentary liver is visible in these specimens, extending backwards on the left side of the intestinal mass. The intestinal canal is of almost uniform size throughout, there being no distinction between intestine and stomach.

IV. This specimen measured a little less than ten inches in length, but the embryos were of much larger size, having a length of two and a quarter inches; the umbilical sac had disappeared, (Fig. 7,) but the fissure on the under side of the abdomen still remained, and what seems quite remarkable, had grown in dimensions just in proportion to the entire fœtus, so that in these specimens it measured one inch in length, and was consequently longer than the whole embryo of the first specimen noticed above. The edges of the fissure were united by the intermedium of a thin membrane, without scales, on which no papillæ were noticed, and was sufficiently lax to allow the edges of the fissure to separate from each other to a slight extent. The transverse band upon the cornea was now distinct, though it had not yet become as opaque as in the adult.

Seven fœtuses were found in the ovary; on the sides of

them one or two dark longitudinal lines were now visible; the general form of the body had assumed more precisely that of the adult, and, as noticed by Valenciennes, the intestines had obtained their permanent form. The external sexual characters were not visible in any of the specimens examined, though they were seen and figured in specimens of about the the same size by Valenciennes.

All of the fœtuses of this female had escaped from their original sacs, (no traces of which were now visible,) and were all contained in one large cavity formed by the dilated ovary which now had become analogous to an uterus, and extended from the genital opening as far forwards as the bases of the pectoral fins. The walls of this ovarian sac were sufficiently thin to allow the fœtuses to be seen through them; on its inner surface, as well as on that of some of the other specimens, were to be seen numerous immature ova, some of them microscopic and others as large as the sixteenth of an inch in diameter. The coexistence of immature ova on the walls of the ovarian cavity, with fœtuses within it, corresponds with what was noticed by Duvernoy in his investigations of the embryology of Pœcilia.* The more minute ovarian eggs, though for a long time macerated in alcohol, yet preserved their microscopic characters to a remarkable degree. The smallest consisted of a cell, in the centre of which a nucleus was visible, and around this last were a few granules (Fig. 1); in the larger ova the granules have become more and more abundant, and in some instances obscure the nucleus or germ cell. After the egg has increased to a certain size, a clear space (Figs. 2, 3 and 4) appears exterior to the vitelline membrane, which gradually increases to nearly twice the diameter of the egg itself; this clear space is limited by the substance of the stroma which becomes condensed around it, and thus forms a distinct sac. If the ovum be compared to that of a mammal, then the sac just described may be said

* Annales des Sc. Naturelles. T. i. N. S. 1844.

to be analogous to a Graafian vesicle; that is, the egg of the fish floats free in a sac much larger than itself, just as the mammiferous egg does in the vesicle of De Graaff. There were no intermediate conditions between this and the impregnated condition to enable me to determine whether or not it is this sac which forms the external covering of the fœtus. Valenciennes seems to adopt the idea that it does, and compares it to a chorion.* If this view of its nature be true, then there seems no alternative, since development advances so far before the sac ruptures, but to suppose that impregnation must take place through its parietes and that the spermatozöon cannot enter bodily into the substance, or even come in direct contact with the vitelline membrane of the egg, except through the walls of this outer covering, which is not probable. It would seem that it must act simply by its presence on the surface of the egg-sac, or by an endosmosis of its fluid contents through the membranes by which the ovum is invested.

A microscopic examination of the egg-sacs in the advanced fœtuses proves conclusively, that they do not consist of loose areolar tissue only, as stated by Valenciennes,† but that while the tissue in question forms the basis of them, they are in reality very highly vascular, large trunks and minute ramifications of vessels being easily traced by the aid of the coagulated blood which they contain.

In comparing fœtuses of different stages of development together, a very interesting question is presented to us in connection with their growth. In the smallest specimen examined, the yelk was no longer visible, it had been wholly consumed in supplying materials for the formation of the embryo; and yet subsequent to this disappearance of the yelk, the embryo, while still in its ovarian sac and cut off from all external communication, continues to increase in size,

* "La cellule qui contient un œuf fécondé s'aggrandit et finit par former une sorte de Chorion." Op. cit. T. xviii. p. 261.

† Op. cit. p. 261.

and grows until it acquires the length of an inch and a quarter, which gives the size of the longest fœtus which our specimens furnished. Even the umbilical sac and the fissure which succeeds it, continue to grow after the yelk has disappeared. As a general rule among oviparous fishes, the yelk supplies *all* the material required for the growth of the fœtus; and the same holds good with regard to nearly all Batrachians,* to scaly Reptiles and Birds. So general has this rule been believed to be, that none but Mammals have been supposed to contribute any thing beyond the materials of the egg to the support of the young. But recent observations go to prove that some fishes, such as the Torpedo among the Plagiostomes, the Embiotoca among osseous fishes, are to be placed in the same category as Mammals, in relation to the fact of being nourished by the parent during gestation, although neither a placenta is formed nor does any direct vascular communication whatever exist between the fœtus and the maternal circulation. We cannot explain the growth of the fœtal Anableps by any other hypothesis than that it is nourished by a fluid secreted by the walls of the sac in which it is lodged in the earlier stages, or by the parietes of the general ovarian cavity in which the fœtuses are received towards the end of gestation. The high degree of vascularity of the egg-sac is favorable to this supposition. As the body of thè fœtus, at a very early period, becomes covered with scales, absorption could only take place through the intestinal canal or by the surface of the yelk-sac, which invests the viscera and increases in size for a long period after the yelk itself has wholly disappeared. In the later stages of gestation, even the yelk-sac is out of the question, since it in turn wholly disappears, while the fœtus occupies the general cavity of the ovary.

* The only exception among Batrachians, as yet noticed, is found in the Pipa of South America. See Observations on Pipa Americana, by Jeffries Wyman, M. D., in American Journal of Science, 2d Series, vol. xvii. p. 369.

Valenciennes has given a very full and detailed description of the modified ventral fin, which serves the function of an external male organ, and of its connection with the excretory tubes of the testis; yet, in some respects, the specimens which I have examined differ from his description. In these the anal fin (Fig. 9) consisted of two portions, one of which forms a conical-shaped body resting on an enlarged base and attached to or forming the anterior edge of the fin, and is covered with scales as far as its termination; its anterior half is colored black at the base, but the whole of it is so colored nearer the apex; at the extremity is the genito-urinary opening, as described by Valenciennes. Behind the genital portion, and partially imbedded in it, is the true ventral fin, containing seven or eight rays parallel to the genital tube, the posterior being the shortest, and about one half as long as the whole fin. In a larger and adult male, measuring about seven inches in length, the genital portion of the fin has become very much longer and stouter in consequence of the development of muscular fibres in its interior. The genital opening, which, in the preceding specimens, was not at the extremity of the fin, has now become terminal, the fin rays have become proportionally shorter and so closely applied to the posterior face of the genital portion as to be detected with difficulty. In the figure of the fin, given in the *Histoire Naturelle des Poissons*, the artist has erroneously represented the fin rays as if they were attached by their base to the side of the genital tube; when in reality they are attached to the under side of the abdomen, and are parallel to the genital tube, but partially imbedded in it.

Valenciennes inclines to the belief that the fin in question could not be used as an intromittent organ in consequence of the scales and fin rays pointing in such a manner as to prove an obstacle. This objection applies less to the adult than the younger specimens, since the fin rays have become much less prominent; but when the structure of the intro-

mittent organ in the males of some Mammals is remembered, as of the Agouti, where spines, projecting in different directions, offer far more serious mechanical opposition, we can readily believe that a structure like that of the anal fin of Anableps may be readily introduced into the genital tube of the female. Still, in the ordinary position of the two sexes it could not be thus used unless bent forwards.

EXPLANATION OF THE FIGURES.

Fig. I. Primitive ova, each consisting of a single nucleated cell.

Figs. II. and III. Ova somewhat enlarged, around which a transparent space is formed in the stroma of the ovary.

Fig. IV. A more advanced egg, in which the transparent space has become much enlarged. The vitelline membrane is distinctly visible, and the nucleus contains granules or nucleoli of different sizes. On the left of this figure is an earlier ovum, in which the transparent space is just forming.

Figs. V. and VI. Two fœtuses with yelk-bags attached. On comparing the two figures, which are of the size of nature, it will be seen that fœtus and yelk-bag both grow simultaneously.

Fig. VII. A more advanced and nearly mature fœtus, in which the yelk-bag has been absorbed, and only a linear fissure or umbilicus remains; this is closed by a thin, scaleless membrane, and extends from the space between the pectoral fins in front to that between the ventrals behind. The fœtus has acquired a length nearly one fourth of that of the adult Anableps.

Fig. VIII. A portion of the yelk-bag, highly magnified, showing the papillæ filled with granules, which cover its surface.

Fig. IX. The anal fin. The genital portion is shorter than the fin rays and membrane. In older specimens, however, the former becomes proportionally longer, and the latter become so much diminished in size as to be scarcely traceable.*

* For complete and accurate descriptions and figures of other details relating to structure and development, reference may be made to the *Hist. Nat. des Poissons*, by Cuvier and Valenciennes, tome xviii. p. 245.

Art. XXVII.—*On the* Crustacea *and* Echinodermata *of the Pacific Shores of North America.* By Wm. Stimpson. Part I. Crustacea.

There is no part of the world in which so large accessions to our knowledge of Zoölogy and Botany have been made within the past five years, as in that part of our continent which lies west of the Rocky Mountains. The results of the numerous government surveys, as elaborated by Baird and Girard, and the investigations of Cassin, Ayres, and the Californian naturalists, have brought to light hundreds of new and interesting Vertebrates, while the Insects have been extensively studied by Le Conte and the Testacea by Gould. The Marine Invertebrata have however as yet excited but little attention among our naturalists. With the exception of the descriptions of Crustacea by Dana and Randall, nothing has been done here in this department, while in Europe several articles having more or less relation to the subject have recently appeared in various scientific periodicals.

It is with the view of calling attention to this interesting division of our western fauna, and of opening a rich field, that I have been led here to give something more than a description of the novelties collected by Mr. Samuels;—in fact, to present a view of the present state of our knowledge of the Crustacea and Echinodermata of the West Coast.*

* The following works have been consulted in the preparation of this article: For the Crustacea:—

Ar. Fr. Wiegmann. *Beschreibung einiger neuen Crustaceen des Berliner Museums aus Mexico,* etc. Archiv für Naturgeschichte, 1836, i. 145–151.

J. W. Randall. *Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend from the West Coast of North America, with descriptions and figures of new species.* Journal of the Academy of Natural Sciences of Philadelphia, vol. viii. 1839, pp. 106–147. Pl. III—VII.

R. Owen. *The Zoölogy of Captain Beechey's Voyage, Crustacea.* (1839.)

M.M. Milne-Edwards et H. Lucas. *Description des Crustacés nouveaux ou peu connus.* Archives du Muséum d'Histoire Naturelle, 1841, ii. 461.

The Smithsonian Institution has with its usual liberality allowed me the use of the very numerous specimens in its

W. F. Erichson. *Uebersicht der Arten der Gattung Astacus.* Archiv für Naturgeschichte, 1846, i. 86–103, 375–377.

A. White. *On a new genus of Crustacea.* Annals and Magazine of Natural History, 1846, xvii. 497.

——— *List of the specimens of Crustacea in the British Museum.* London. 1847.

——— *Description of Echidnocerus cibarius, a new species and subgenus of Crustacea.* Proceedings of the Zoölogical Society of London, 1848, p. 47; Annulosa, Pl. II. and III.

——— *Some remarks on Crustacea of the genus Lithodes, with a brief description of a species apparently hitherto unrecorded.* Proceedings of the Zoölogical Society of London, 1856, p. 132. Annulosa, Pl. XLII.

G. Newport. *Note on the genus Atya of Leach, with descriptions of new species, etc.* Annals and Magazine of Natural History, 1847, xix. 158–160.

F. Brandt. *Die Gattung Lithodes, Latreille, nebst vier neuen ihr Verwandten von Wosnessenski entdeckten als Typen einer besondern Unterabtheilung (Tribus Lithodea) der Edwards'chen Anomuren.* Bulletin physico-mathématique de l' Académie de Saint-Pétersbourg, 1849, vii. 171–175.

——— *Vorläufige Bemerkungen über eine neue, eigenthümliche, der Fauna Russlands angehörige Gattung oder Untergattung von Krabben (Crustacea Brachyura) aus der Edwards'chen Abtheilung der Corysten.* Bulletin physico-mathématique de l' Académie de Saint-Pétersbourg, 1849, vii. 178, 179.

——— *Beiträge zur Kenntniss der Amphipoden.* Loc. cit., 1851, ix. 132, 310, etc.

——— *Middendorff's Reise in den Sibiriens, Zoölogie;* Theil I. Krebse, pp. 79–162, (1851.)

L. R. Gibbes. *On the Carcinological Collections of the United States, and an enumeration of the species contained in them, with notes,* etc. Proceedings of the American Association for the Advancement of Science; Third Meeting, Charleston, S. C., 1850, pp. 167–201.

C. Girard. *A Revision of the North American Astaci,* etc. Proceedings of the Academy of Natural Sciences of Philadelphia, 1852, vii. 87–91.

J. D. Dana. *Crustacea of the United States Exploring Expedition,* 1852.

——— *Catalogue and Descriptions of Crustacea collected in California by Dr. John L. Leconte.* Proceedings of the Academy of Natural Sciences of Philadelphia, 1854, vii. 175–177.

——— *Description of a new species of Cryptopodia from California.* American Journal of Science, 2d Series, vol. xviii. p. 430, (1854.)

M. Milne-Edwards. *Mélanges Carcinologiques.* Annales des Sciences Naturelles, 1852–1853.

H. de Saussure. *Description de quelques Crustacés nouveaux de la côte occidentale du Mexique.* Revue et Magasin de Zoölogie, 1853, v. 354–368.

museum, obtained mostly through the researches of Lieut. TROWBRIDGE, Drs. SUCKLEY and NEWBERRY, and Mr. A. S. TAYLOR. These specimens, together with those found by myself while on the North Pacific Exploring Expedition, form a large addition to Mr. Samuels's collection, and have enabled me to make more extended and satisfactory observations upon these divisions of our Western Fauna.

It will be seen that more than one hundred and thirty species of the class Crustacea have been determined to exist in the region now under consideration, a number which seems quite large when we consider that so recently as in the year 1838 not a single species was known to science as forming part of its fauna.* But we cannot suppose even this number to be more than a fourth part of that which will be reached when a thorough search shall be instituted. Many families which are undoubtedly represented here by one or more species, have not yet been noticed; and that part of the coast which is included within the

W. P. GIBBONS. *On a new genus of Crabs.* Proceedings of the California Academy of Natural Sciences, 1855, vol. i. pp. 48, 49.

T. BELL. *Horæ Carcinologicæ, or Notices of Crustacea.* I. *A monograph of the Leucosiadæ.* Transactions of the Linnæan Society of London, 1855, xxi. 277. Pl. XXX—XXXIV.

W. STIMPSON. *On some Californian Crustacea.* Proceedings of the California Academy of Natural Sciences, 1856, vol. i. pp. 87–90.

——— *Descriptions of new species of Crustacea from the Western Shores of North America.* Proceedings of the Boston Society of Natural History, 1857, vol. vi. pp. 84–89.

For the Echinodermata :—

ESCHSCHOLTZ. *Zoölogischer Atlas.*

F. BRANDT. *Prodromus descriptionis animalium ab H. Mertensio in orbis terrarum circumnavigatione observatorum.* Fascic. I. Petropoli, MDCCCXXXV.

J. E. GRAY. *On the class Hypostoma.* Annals and Magazine of Natural History, vi. 176, etc.

VALENCIENNES. *Voyage de la Venus.*

W. O. AYRES. *On Californian Echinodermata.* Proceedings of the California Academy of Natural Sciences, 1855, i. 68.

* "Nous ne savons rien sur les Crustacés de la côte occidentale de l' Amerique du Nord." MILNE-EDWARDS, *Hist. Nat. des Crust.* iii. 564, (1840.)

tropics must swarm with Crustacea of the higher orders, the species of which are as yet entirely undetermined. Without, therefore, attempting to generalize upon so imperfect data, we may notice a few facts with regard to the character of the Crustacean fauna, which are so prominently marked that they will be but little affected by future discoveries.

The tribe *Oxyrhyncha* is very numerously represented in the rocky fiords of the upper coast, and a predominance of deep-water forms may be observed, the genera of which are mostly peculiar to this region. The restricted genus *Cancer* (*Platycarcinus*, M. Edw.) is remarkably well represented here, by four species, very abundant in individuals, and which are in fact the most common crabs known. On the other hand, with the exception of a single species of *Ozius*, no other examples of the *Cancrinea*, elsewhere so numerous, have yet occurred; and it is indeed singular that the sandy shores of California, so well adapted to *Lupa* and its allies, should have as yet furnished no species of the *Portunidæ*. In this point a striking difference is shown between the marine fauna of this and the eastern coast, where such forms are abundantly distributed.

The chief and most noticeable feature, however, which at once gives a peculiar character to the Decapoda of the Northwestern coast, is the remarkable development of the *Lithodina*. But few species of the rare and curious crabs of this family, all denizens of deep water, were until recently known, one of which (the only one described in the "Histoire Naturelle des Crustacés,") is found in the North Atlantic, one in the Antarctic Ocean, and two in the seas of Japan and Kamtschatka. Within the past ten years, however, no less than nine additional species have come to light, nearly all of which were found on the shores of California, Oregon, and Russian America. Among these are some gigantic and representative forms which tend greatly to enlarge our views of the extent, importance, and relations of the group. For our knowledge of these interesting Crustaceans, we are chiefly indebted to Brandt of St. Petersburg.

Among the fresh-water Crustacea we may notice the fact, first observed by DANA* in *Astacus leniusculus*, that the Cray-fish of the rivers running into the Pacific have branchiæ on the fifth pair of legs, and, like those of Europe, are classed among the true *Astaci*. AGASSIZ † saw the same thing in *A. Gambelii*, and I have found it to be invariably the case in the species of this region, among which there are several not hitherto described in the Museum of the Smithsonian Institution. Our eastern Cray-fish, on the contrary, all belong to the genus *Cambarus*, having no branchiæ on the legs of the fifth pair,—a singular instance of the coincidence of peculiarities of structure with those of geographical distribution. ERICHSON ‡ does indeed describe two species of *Cambarus* from Southern Mexico, but we have reason to suppose that these belong rather to the eastern slope of the Rocky Mountains.

In the preparation of the following paper I have used every means in my power to identify the species described by previous authors, and have done this by actual comparison of specimens wherever it was possible. Through the kindness of Dr. BRIDGES I was enabled, during a short visit to Philadelphia for that purpose, to examine the typical specimens of RANDALL's species, and those of DE SAUSSURE. To Professor DANA I am indebted for much assistance, and for the use of the few specimens of his types which were particularly desired for comparison,—the admirable exactness of his figures and descriptions rendering any further means of identification in most cases unnecessary.

Full descriptions will be here given of the new species only, but notes are appended to several already known, including remarks on characters which have been overlooked by previous authors. Enough is given in most instances to enable the reader to determine any known California or Oregon species.

* U. S. Exploring Expedition, Crust. i. 524.

† Proc. Acad. Nat. Sci., Philad. vi. 375.

‡ Archiv für Naturgeschichte, 1846, i. 99.

DECAPODA BRACHYURA.

Tribe OXYRHYNCHA.

CHIONŒCETES BEHRINGIANUS. Stimpson.

Chionœcetes Behringianus, Stimpson; *Proc. Bost. Soc. Nat. Hist.* vi. 84.

Carapax with numerous scattered unequal rugose prominences which are blunt and wart-like about the middle, but become more acute anteriorly and at the sides. Superior surface covered with a short pubescence. The broad channels above the postero-lateral margins are nearly smooth, but their double margins are granulated. The inferior antero-lateral margin is armed with about fourteen small bifid teeth which diminish in size forwards. The feet are everywhere slightly pubescent, with the third articles scabrous or echinulate above; those of the first pair are muricated along the angles, and everywhere somewhat scabrous on their upper surfaces. The abdomen in the male is one third the width of the sternal plastron at its penultimate article, the infero-lateral angles of which are somewhat produced and tumid. Length of the carapax, 2.5; width, 2.52 inch.

This species may be distinguished from *C. opilio*, Kroyer, judging from the descriptions of that naturalist, by the shorter feet of the male;—those of the second pair, in the species here described, being not more than twice the length of the carapax, while those of the first pair are not much more than half as long as those of the second. The abdomen consists in both male and female of seven articles, the three nearest the base being strongly granulated. Kroyer, in his diagnosis of the genus, states the number of articles to be six, although O. Fabricius * gives seven as the number in his *Cancer phalangium*.

It inhabits deep water, the specimens described being

* Fauna Grönlandica, p. 234; n. 214.

dredged on a muddy bottom at the depth of thirty fathoms, off Cape Romanzoff. It was also found in Behring's Straits, by Commodore RODGERS, of the North Pacific Expedition.

It is in the Museums of the Boston Society of Natural History, of the Smithsonian Institution, and of the Jardin des Plantes.*

HYAS COARCTATUS. Leach.

Hyas coarctatus, LEACH; *Malac. Pod. Brit.*, Pl. XXI. b. MILNE-EDWARDS; *Hist. Nat. des Crust.*, i. 312. BRANDT; *Sibirische Reise*, i. 79.

Dredged off Cape Romanzoff by the North Pacific Expedition.

This is an arctic species, found on both boreal shores of the Atlantic. It is also the most common crab found in Behring's Straits, and is reported to exist on the shores of Kamtschatka and in the Sea of Ochotsk.

Mus. Smithsonian.

HYAS LYRATUS. Dana.

Hyas lyratus, DANA; *U. S. Exploring Expedition, Crust.*, i. 86, Pl. I. f. 1.

Distinguished from the preceding species by the broad, wing-like, antero-lateral expansions of the carapax. It in-

* As it is always desirable to know where typical specimens may be found for comparison, I shall indicate in every case the different museums in which examples of the species herein catalogued are deposited. For convenience, the following abbreviations will be used :—

Museum of the Boston Society of Natural History	Mus. Bost. Soc.
" " " Smithsonian Institution	" Smithsonian.
" " " Philadelphia Academy of Natural Sciences	" Phil. Acad.
" " " U. S. Exploring Expedition	" Expl. Exped.
" " " California Academy of Natural Sciences	" Cal. Acad.
" " " Yale College	" Yale.
" " " Imperial Academy of St. Petersburg	" Acad. Petrop.
" " Berlin	" Berlin.
" " the Garden of Plants at Paris	" Paris.
" " " Royal College of Surgeons, London	" R. C. S.
" " " Zoölogical Society of London	" Zoöl. Soc.
British Museum	" Brit.

habits deep water on the coast of Oregon, where it was found by the U. S. Exploring Expedition.

Mus. Expl. Expedition.

HERBSTIA PARVIFRONS. Randall.

Herbstia parvifrons, RANDALL; *Journal of the Academy of Natural Sciences of Philadelphia*, viii. 107. GIBBES; *Proceedings of the American Association for the Advancement of Science*, 1850, p. 170.

"Western America." (Nuttall.) This species I have not seen.

LOXORHYNCHUS. nov. gen.

Carapax pyriformis, plus minusve spinosus et pubescens; regione stomachali amplâ, convexâ; regionibus hepaticis parvis, prominentibus, spinâ unâ saltem validâ in medio armatis. Rostrum bifidum, plus minusve deflexum; cornubus divaricatis. Orbita imperfecta, supra infraque sinu profundo longitudinali interrupta; cavo pediculi subtubulato. Oculi sat breves, retractiles, non sese latentes. Dens præorbitalis validus; spina postorbitalis acuta, fere longitudinalis, sub quâ spina parva juxta basim externam articuli primi antennæ externæ sita. Pars mobilis antennarum externarum rostro vix celata, flagellis longis; articulus immobilis latus, fere quadratus, apice externo spinâ acutâ lateraliter porrectâ armato. Epistoma magna, subtrapezoidalis. Maxillipedes externi fere ut in *Pisâ;* apice interno articuli secundi valdè productâ et rotundatâ. Pedes subcylindrici, secundi paris longiores; tarsi breves non spinulosi; digiti primi paris maris fæminæque margine interno toto denticulato. Abdomen 7-articulatum.

This genus is proposed for the reception of two new species of Maioid crabs, which, though differing from each other considerably in the characters of the surface of the carapax, and some other points, yet are so closely allied in the structure of the orbits and antennæ that they cannot be generically separated. They unite the characters of several generic groups, so that their position is somewhat doubtful, although probably among the *Pisinæ.* The deflection of the rostrum is quite characteristic, but this feature is much less developed in one species than in the other. The eyes are short, and do not reach the tip of the post-orbital spine.

The genus will be perhaps best characterized by a comparison with others. From *Pisa*, which it resembles in the shape of the carapax, it differs in the less excavated orbits, and single supra-orbital fissure, the want of spinules on the tarsi, and the much broader basal article of the external antennæ. This latter character also separates it from *Herbstia* and *Halimus*. From the *Chorininæ* it may be distinguished by the non-concealment of the external antennæ, and the shorter and broader rostrum. It is allied to *Paramicippa* in the deflection of the rostrum, but differs in the longer epistome, and the inferior position of the external antennæ. The cavities of the eye-peduncles are less tubular than in *Pericera*, the eyes being retractile. *Perinea* has a shorter carapax and a much shorter rostrum, leaving the external antennæ considerably exposed.

This genus, like several others of the tribe, seems to be peculiar to this coast. The species are crabs of large size.

LOXORHYNCHUS GRANDIS. Stimpson.

Plate XIX. f. 1, and XXII. f. 1.

Loxorhynchus grandis, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

Carapax pyriform, subglobose; branchial regions broadly expanded somewhat as in *Libinia*. Surface covered with small warts of nearly uniform size, which are blunt and rounded about the middle portion of the carapax, but become sharp and spine-like anteriorly and on the sides, where they are also more crowded. There are seven spines on the hepatic protuberances, two of which are larger. Pubescence very short and mostly obsolete above, leaving the surface punctate with minute pit-like depressions. Rostrum a little longer than wide, slit for somewhat more than half its length, and greatly deflexed, pointing downward in a direction almost at right angles with the horizontal axis of the body. The præorbital spine is emarginate at its extremity. The feet are rather short and stout, covered with a short,

thick villosity. Those of the first pair shorter than those of the second, with fingers touching each other along the whole length of their denticulated inner edges; wrist somewhat tuberculous above; third article with four small distant spines on the superior margin, the largest being at the summit of the abrupt expansion at the articulation of the fourth article. A single subterminal spine on the third article of the second pair of feet; this spine becomes almost obsolete in the posterior pairs, which are elsewhere smooth. Tarsi short and thick, somewhat curved, with corneous tips easily separable in dry specimens. The color of exposed parts is reddish inclining to roseate, becoming yellowish-white on the sides. Fingers white. The following are the dimensions of a female:—

Length of carapax	5.55 inch.
Width " "	4.54 "
Length of rostrum from base of præorbital spine	0.96 "
Distance between rostral tips	0.39 "
" " tips of præorbital spines	1.30 "
Length of 1st pair of feet	4.90 "
" " 2d " "	6.45 "
" " 5th " "	4.75 "

Taken on the coast of California, near San Francisco, by Lieut. TROWBRIDGE.

Mus. Smithsonian.

LOXORHYNCHUS CRISPATUS. Stimpson, n. s.

Plate XXII. f. 2, 3, and 4.

Carapax very much elongated, somewhat triangular; regions separated by deep depressions. There are nine large tubercles above, with sharp apices, between which smaller ones are interspersed. These tubercles are as follows: one at the posterior summit of the stomachal region, one at each hepatic region, (projecting laterally,) two on each side at the branchial regions, and one at either extremity of the abruptly convex intestinal region. The sides of

the carapax are nearly perpendicular, and provided with tubercles. The whole surface of the body and feet (excepting the pincers and tips of the tarsi) above and below, is covered with short, thick hair, which, on the front and sides of the carapax and along the angles of the legs, becomes longer, stiff, and curled. The rostrum is but slightly deflexed, and not curved; it is slit two thirds of its length, the horns diverging, but slightly turned inwards at their sharp extremities. Præorbital spines slender, sharply pointed. External antennæ long, the flagella reaching much beyond the tips of the rostrum. The feet are somewhat triangularly prismatic; a character best seen in the third joints. The fourth articles in the posterior four pairs have a longitudinal groove on the upper surface. In the first pair the fingers are rather slender, and the posterior tooth of the movable one is much larger than the others; in this pair of feet there are two small spines on the third joint. The sternal plastron and abdomen in the male are transversely grooved with deep channels corresponding in number to the articulations. The color beneath the pubescence is bluish-white, the rostrum, spines, and feet being of a bright carmine hue.

Length of carapax, ♂	3.45
Greatest width	2.30
Length of rostrum	0.67
Distance between tips of præorbital spines	0.82
" " " anterior spines of branchial region .	1.40
Length of 1st pair of legs	3.50
" " 2d " "	4.40

Found at the island of San Miguel, off the coast of California, near San Pedro. This is another of the novelties for which we are indebted to that indefatigable observer, Lieut. Trowbridge, who, though devoting his chief attention to the Vertebrata, has succeeded in making collections of the lower forms of animal life, of greater extent and interest than has any other student of Californian Zoölogy.

Mus. Smithsonian.

LIBINIA AFFINIS. Randall.

Libinia affinis, RANDALL; *Jour. Acad. Nat. Sci., Philad.* viii. 107. GIBBES, *Proc. Am. Assoc.* 1850, p. 170.

This species is rare, Nuttall's specimen being the only one yet found. It is very closely allied to *L. canaliculata* of the eastern coast, but differs in its less convex carapax and smoother hand.

Upper California, (Nuttall.)

Mus. Phil. Acad.

CHORILIA LONGIPES. Dana.

Chorilia longipes, DANA; *U. S. Expl. Expedition, Crust.* i. 91; Pl. I. f. 5.

This species may be distinguished from the other Oxyrynchs of this coast by its long, bifid, pubescent rostrum, the forks of which are nearly parallel. The carapax is without pubescence, with a few distant tubercles and a sharp spine on each side at the branchial region. The legs are long, and, with the exception of the first pair, very slender. It is about $1\frac{1}{2}$ inches in length.

Oregon, (Expl. Exped.)

Mus. Expl. Exped.

SCYRA ACUTIFRONS. Dana.

Scyra acutifrons, DANA; *U. S. Exploring Expedition, Crust.* i. 95; Pl. II. f. 2.

This little crab may be recognized by its ovate spineless carapax, the regions of which are strongly prominent; and by its short, bifid, lamellar rostrum.

Puget Sound, (Pickering.)

Mus. Expl. Exped.

OTHONIA PICTETI. De Saussure.

Othonia Picteti, DE SAUSSURE; *Revue et Magasin de Zoölogie,* v. 357, Pl. XIII. f. 2.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

Dr. Johnston used the name *Othonia* for a genus of Annelides in 1835,—prior to its application to the crustacean group by Bell. But Johnston's genus seems to be the same as *Fabricia*, Blainv. 1828.

MITHRAX ARMATUS. De Saussure.

Mithrax armatus, De Saussure; *Rev. et Mag. Zoöl.* v. 355, Pl. XIII. f. 1.

Mazatlan, (Verreaux.)
Mus. Phil. Acad.

OREGONIA GRACILIS. Dana.

Oregonia gracilis, Dana; *U. S. Exploring Expedition, Crust.* i. 106, Pl. III. f. 2.

The *Oregoniæ* may be distinguished by the great length of their legs, the penultimate joint of which is not expanded; and by the long, slender, post-orbital spine. The rostrum is slender, and forked nearly from its base; in this species the horns are long, and diverge toward their extremities.

Puget Sound, (Pickering.)
Mus. Expl. Exped.

OREGONIA HIRTA. Dana.

Oregonia hirta, Dana; *U. S. Expl. Exped., Crust.* i. 107, Pl. III. f. 3.

This is more hairy than the preceding species, and has a proportionally longer rostrum. Both are inhabitants of deep water.

Puget Sound, (Pickering.)
Mus. Expl. Exped.

PUGETTIA GRACILIS. Dana.

Pugettia gracilis, Dana; *U. S. Exploring Expedition, Crust.* i. 117, Pl. IV. f. 3.

The genus *Pugettia* is characterized by the large post-orbital expansions of the depressed, unarmed carapax. Ros-

trum bifurcate, horns diverging. The deep constriction between the hepatic and branchial regions renders it easily distinguishable from all other crabs of this coast, except perhaps *Hyas lyratus*, which has a simply cleft rostrum. In the present species the post-orbital expansions are triangular.

Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

PUGETTIA RICHII. Dana.

Pugettia Richii, DANA; *U. S. Exploring Expedition, Crust.* i. 117, Pl. IV. f. 3.

In this the post-orbital expansions are bilobate, with the lobes acute. Larger than the preceding; anterior feet of great size.

San Diego, (W. Rich.)

Mus. Expl. Exped.

EPIALTUS PRODUCTUS. Randall.

Epialtus productus, RANDALL; *J. A. N. S. Phil.* viii. 110. GIBBES; *Proc. Am. Assoc.* 1850, p. 173. DANA; *U. S. Exploring Expedition, Crust.* i. 133, Pl. VI. f. 2.

Easily recognized by its smooth quadrate carapax, with two distant teeth on either side. It is the most common maioid crab on the coast of California and Oregon, and is usually found among sea-weeds on rocks just below low-water mark. Its color is olivaceous when alive.

Puget Sound, (Suckley;) Mouth of the Columbia, (Trowbridge;) Farallone Is. (Trowbridge;) Tomales Bay, (Samuels;) entrance of San Francisco Bay, (Stimpson;) Monterey, (Trowbridge.)

Mus. Smithsonian; Bost. Soc.; Phil. Acad.; Paris; Acad. Petrop.

EPIALTUS NUTTALLII. Randall.

Epialtus Nuttallii, RANDALL; *loc. cit.* viii. 109, Pl. III. GIBBES; *loc. cit.* p. 173.

Differs from the preceding by its more rounded outline and larger rostrum.

Upper California, (Nuttall.)

Mus. Phil. Acad.

PARTHENOPE PUNCTATISSIMA. Owen.

Parthenope punctatissima, OWEN; *Zoölogy of Beechey's Voyage, Crust.* 81, Pl. XXIV. f. 4.

This is almost certainly a *Lambrus*, but having been unable to procure a specimen and examine the characters of the antennæ, I refrain from adding to the synonymy.

Coast of California, (Belcher.)

Mus. Zoöl. Soc.; R. C. S.

CRYPTOPODIA OCCIDENTALIS. Dana.

Cryptopodia occidentalis, DANA; *Am. Jour. Sci.*, 2d Ser. xviii. 430, (wood-cut.) GIBBES, *Proc. Elliott Soc. Nat. Hist. Charleston, S. C.* i. 36.

This curious crab is distinguished from all others found on this coast, by the smallness of its posterior four pairs of feet, which are entirely concealed beneath the carapax; those of the first pair on the contrary are very large, angular, and much longer than the shell.

Monterey, (W. Rich.)

Mus. Expl. Exped.

TRIBE CYCLOMETOPA.

CANCER MAGISTER. Dana.

Cancer magister, DANA; *U. S. Exploring Expedition, Crust.* i. 151, Pl. VII. f. 1. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88. Cancer irroratus, RANDALL, l. c. (non Say.)

The largest of the numerous species found on the Cali-

fornian coast. Antero-lateral margin ten-toothed; teeth but little prominent, with the exception of the posterior one, which is separated from the next by a considerable space; they gradually diminish in size toward the orbits. Terminal segment of abdomen in the male short, with a rounded extremity. Third article of outer maxillipeds somewhat granulated, with the exterior apex broadly truncated. Feet of the second pair longest, and equal in length to the width of the carapax. In adult specimens the tarsi of the fifth pair of feet are very much compressed, and not conspicuously ciliated below. In a specimen from Sitka, the granulation on the upper side of the feet of the posterior pairs is much stronger, and the teeth on the crest of the hand less numerous and higher, than in Californian specimens. The following are the measurements of several specimens in the Museum of the Smithsonian Institution:—

Locality.	Sex.	Length of Carapax.	Width of Carapax.	Proportions of Carapax.
Puget Sound,	♂	0.875 inch.	1.27 inch.	1:1.45 inch.
San Francisco,	"	1.23	1.80	1:1.46
Monterey,	"	2.51	3.77	1:1.50
San Francisco,	"	4.42	7.00	1:1.58
Sitka,	"	4.90	8.85	1:1.80
San Francisco,	♀	2.55	3.90	1:1.53

By these measurements and proportions it will be seen that this species increases in width with age, and that the female is slightly broader than the male. I have seen no specimen according in dimensions with the variety figured by Dana.

This species was erroneously referred by Randall to *C. irroratus*, Say. The succeeding species, however, approaches much more closely to the eastern crab.

C. magister has been found at Sitka, (Trowbridge;) Puget Sound, (Suckley;) San Francisco Bay, (Pickering, Kennerly, etc.;) and at Monterey, (Taylor.) It is the common crab of the San Francisco market, and is caught very abundantly about the wharves of the city. It is of a light

reddish-brown color, darkest anteriorly, often light orange below; inner sides of the anterior feet and hands crimson.

Mus. Smithsonian; Expl. Exped.; Phil. Acad.

CANCER GRACILIS. Dana.

Cancer gracilis, DANA; *U. S. Exploring Expedition, Crust.* i. 153, Pl. VII. f. 2.
STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This is the smallest species of the genus known, although found of a much larger size than that figured by DANA. It may be distinguished from the young of *C. magister* by the emargination or slight tooth on the postero-lateral margin near its outer extremity, as well as by its proportions. It differs from *C. irroratus*, (*C. Sayi*, GOULD,) which also possesses the postero-lateral emargination, by its smoother and more slender tarsi, and by the granulation of the central portions of the carapax. The antero-lateral margins are nine-toothed. Lateral teeth of inter-antennary front deeply separated from, and much larger than, the middle one, although not projecting so far forward. Third article of outer maxillipeds smooth, with the exterior apex rounded. Terminal segment of abdomen in the male elongate-triangular, with a slender, pointed extremity. The following are the dimensions of several specimens now before me:—

Locality.	Sex.	Length of Carapax.	Breadth of Carapax.	Proportion.
Tomales Bay,	♂	1.51 inch.	2.30 inch.	1:1.52 inch.
" "	"	1.60	2.40	1:1.50
" "	"	1.70	2.55	1:1.50
Puget Sound,	♀	1.90	2.80	1:1.47
Tomales Bay,	"	1.45	2.13	1:1.47

We may thus notice that in this species the males are wider than the females.

Puget Sound, (Suckley;) Tomales Bay, (Samuels;) San Francisco Bay, (Expl. Exped.)

Mus. Expl. Exped.; Smithsonian; Bost. Soc.; Phil. Acad.; Acad. Petrop.; Paris; etc.

CANCER PRODUCTUS. Randall.

Cancer productus, RANDALL; *loc. cit.* viii. 116. DANA; *U. S. Exploring Expedition, Crust.* i. 156, Pl. VII. f. 3. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.
Platycarcinus productus, GIBBES; *Proc. Am. Assoc.* 1850, p. 177.

This species was described by RANDALL from young specimens, which differ much from the adult, both in proportions and markings. Having seen only large individuals at the time my paper in the Proceedings of the California Academy was written, I there proposed for them the name *C. perlatus*, in case they should prove different from RANDALL's species. But the possession of a full series of all ages, and the examination of the original specimen at Philadelphia, has now convinced me of their identity. DANA's specimens appear also to have been young, and his description will scarce apply to the adults, in which the teeth on the front and antero-lateral margin are sufficiently projecting and well separated.

The produced and elevated front is the most prominent character of this species. The female is rather more convex than the male. The greatest width is at the penultimate lateral tooth. The postero-lateral margin is emarginated, as in the preceding species. Surface of the carapax unequally granulose, most so toward the margins and on the teeth. Hand tuberculous above, scarcely cristate, the projections being few and blunt; the exterior surface 4-carinate. Posterior feet rather compressed; third articles in all ciliate along the superior edge; tarsi with three longitudinal brushes of short, thick hair along the angles, the superior one in the fifth pair and the posterior one in the other pairs being often obsolete. The terminal article of abdomen in the male is triangular, elongated, with an acuminated extremity, the sides being concave.

This species is of a dark red or madder color above; feet mottled; below dirty white. The following are the dimensions of several specimens :—

Locality.	Sex.	Length of Carapax.	Width of Carapax.	Proportion.
San Francisco,	♂	2.95 inch.	4.90 inch.	1:1.63 inch.
" "	"	2.56	4.18	1:1.63
" "	"	2.47	4.01	1:1.62
" "	"	2.46	4.00	1:1.62
Tomales Bay,	"	2.35	3.78	1:1.60
San Francisco,	"	2.27	3.66	1:1.60
" "	"	2.10	3.36	1:1.60
" "	"	1.97	3.05	1:1.55
" "	"	0.99	1.29	1:1.30
" "	♀	2.84	4.30	1:1.52
Tomales Bay,	"	2.73	4.20	1:1.54
San Francisco,	"	2.15	3.34	1:1.55
Tomales Bay,	"	2.16	3.32	1:1.54
" "	"	2.00	3.07	1:1.54

Here it will be perceived that the male is wider than the female; and also that the males steadily increase in width with age, while the females show some variation. The great breadth in this species renders it easily distinguishable from its congeners.

Distortions of the antero-lateral teeth often occur, rendering the sides somewhat unsymmetrical.

This *Cancer* is common at San Francisco, and is sold in the markets with *C. magister.* It was also found at Tomales Bay by Mr. Samuels, and in Puget Sound by the Exploring Expedition.

Mus. Bost. Soc.; Smithsonian; Phil. Acad.; Paris; Acad. Petrop.

CANCER ANTENNARIUS. Stimpson.

Plate XVIII.

Cancer antennarius, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

Carapax convex; greatest breadth at the penultimate antero-lateral tooth. Superior surface much undulated, very smooth in appearance, but minutely granulated; the granulation being almost obsolete about the middle, but sufficiently well marked towards and at the margin. Antero-

lateral margin convex and well rounded, with nine teeth, the inner one forming the outer angle of the orbit; teeth deeply separated, their edges denticulated, their apices curving forward and very sharp, almost uncinate. Postero-lateral margin with a deep emargination near the extremity, forming a sharp tooth, and another, rather slight, a short distance within the first. These emarginations are much deeper in the young than in the adult. Front sufficiently broad, but not projecting farther forward than the exterior angle of the orbit; inter-antennary portion with three well-separated teeth, the middle one being smaller and rather below the lateral ones; præorbital tooth rather prominent. External antennæ very large and hairy, in length equalling two fifths that of the carapax; apex of basal article projecting considerably beyond the præorbital tooth. Third article of external maxillipeds subquadrate, a little longer than broad; anterior margin nearly transverse, ciliate with long hairs; angles rounded; notch for insertion of fourth article deep, abrupt below, continuous with the margin above. The slight ridge on the palate parallel with its inner margin is more sharply prominent in this than in any other species. Feet of the first pair large, particularly in the male. Carpus and hand rather short and thick, in the adult smoothly rounded above and microscopically granulated, in the young ornamented with small spiniform tubercles; outer surface of hand costate; costæ well marked and granulated in the young, almost obsolete in the adult. Fingers in the female with linear grooves on the sides. Ambulatory feet hairy; third articles overreaching the margin of the carapax; tarsi with thick brushes of short hair along the angles. Margins of abdomen and other parts on the inferior surface generally, very hairy. Terminal article of abdomen in the male slender, with somewhat concave sides and bluntly pointed extremity.

Color above dark purplish-brown; below yellowish-white, spotted with red; finger and thumb black.

The dimensions of two specimens from San Francisco Bay are as follows:—

♂ Length of carapax, 2.43 inch;	breadth, 3.70;	proportion, 1:1.52.
♀ " " 2.13 "	" 3.08;	" 1:1.45.

The male is therefore broader than the female.

Its hairiness and the great length of the outer antennæ distinguish it from all other species. In a variety found in Tomales Bay, the upper surface of the carapax is hairy as well as the sides. The middle tooth of the inter-antennary front is sometimes wanting in this, as in other species.

It is not uncommon about the mouth of San Francisco Bay, inhabiting rocky bottoms at the depth of two or three fathoms. It was also found at Monterey by Mr. Taylor, and at Tomales Bay by Mr. Samuels.

Mus. Bost. Soc.; Smithsonian; Phil. Acad.; Paris; Acad. Petrop.

OZIUS VERREAUXII. De Saussure.

Ozius Verreauxii, De Saussure; *Revue et Magasin de Zoölogie*, v. 359, Pl. XII. f. 1.

Mazatlan, (Verreaux.)
Mus. Phil. Acad.

Tribe CORYSTOIDEA.

TRICHOCERA OREGONENSIS. Dana.

Trichocera Oregonensis, Dana; *U. S. Exploring Expedition, Crust.* i. 299, Pl. XVIII. f. 5.

This little crab has much the aspect of a small *Cancer*, and may be recognized by its rounded carapax, hairy legs, and long antennæ. The whole margin (including the postero-lateral) is dentate with about thirteen teeth on each side.

Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

CHEIROGONUS HIPPOCARCINOIDES. Latreille.

Cancer adsperso-setosus hippocarcinoides, STELLER, *MS.* (fide TILESII.)

Cancer cheiragonus, TILESIUS; *Mem. de l'Acad. Imp. des Sciences de St. Petersb.* 1815, v. 347, Pl. VII. f. 1.

Cheiragonus hippocarcinoides, LATREILLE; *Fam. Nat.* 1825, p. 270. (fide BRANDTII.)

Platycorystes ambiguus, BRANDT; *Bulletin physico-mathém. de l'Acad. de St. Petersb.* 1849, vii. 179.

Platycorystes cheiragonus, BRANDT; in *Middendorff's Sibirische Reise, Zoöl.* i. 85.

Cheiragonus hippocarcinoides, BRANDT; in *Midd. Sibirische Reise, Zoöl.* i. 147.

Telmessus serratus, DANA; *U. S. Exploring Expedition, Crust.* i. 303, Pl. XVIII. f. 8, (*vix* WHITE.)

This crab may be distinguished among those of this coast by its scabrous and setose surface, and the large triangular lateral teeth, of which there are four on the antero-lateral and two on the postero-lateral margin. These teeth have serrated margins, and the outer one on each side is much the largest. The inter-antennary front, which is separated from the præorbital tooth on either side by a broad sinus, has four small equal teeth. Length about two inches. It was found on the coast of Upper California by Dr. Le Conte; in Puget Sound by the Exploring Expedition; and at Sitka by Wosnessenski.

Mus. Acad. Petrop.; Expl. Exped.; Phil. Acad.

CHEIROGONUS ISENBECKII. Brandt.

Platycorystes Isenbeckii, BRANDT; *Bulletin physico-mathém. de l'Acad. de St. Petersb.* 1849, vii. 179.

Cheiragonus Isenbeckii, BRANDT; in *Middendorff's Sibirische Reise, Zoöl.* i. 147

Unalaschka, (Wosnessenski.)

Mus. Acad. Petrop.

This very distinct genus, to which so many names have recently been applied, is now known to include at least four species. That found on the west coast of North America, which occurs also along the shores of the Aleutian Islands, of Kamtschatka, and the Sea of Ochotsk, is dis-

tinct from the *Telmessus serratus* of WHITE. *Platycorystes* (*Podocanthus*) *Isenbeckii* of BRANDT is also properly placed in this genus, and I have recently discovered a new species in the seas of Northern Japan.

The reference to LATREILLE's work, (Les Crustacés, les Arachnides, et les Insectes distribués en familles naturelles, Paris, 1825,) for *Cheiragonus* is given on the authority of BRANDT. This book I have never seen, but it is said to have been republished in CUVIER's "Regne Animal"—edition of 1829. In this latter publication the name *Cheiragonus* certainly does not occur, which is singular, and it is also remarkable that it should have been entirely overlooked by MILNE-EDWARDS. The name occurs, however, in the "Index Universalis" of AGASSIZ, and must undoubtedly have been published somewhere by LATREILLE in 1826. Whether this author gives a generic character, or a simple reference to TILESIUS's description; and whether he designates the species as *C. hippocarcinoides*, I am of course unable to say. If this specific name were not given we must call the species *C. ambiguus*, for TILESIUS's reference to STELLER's MS. name *hippocarcinoides* is not sufficient to give it priority.

TRIBE CATOMETOPA.

GRAPSUS STRIGOSUS. Latreille.

Grapsus strigosus, LATREILLE. Goniopsis strigosus, DE HAAN; WHITE, *Brit. Mus. Catalogue, Crust.* 40.

Specimens in the British Museum, from Lower California, are referred to this species by WHITE.

GRAPSUS PICTUS. De Saussure.

Grapsus pictus, DE SAUSSURE; *Rev. et Mag. de Zoölogie*, v. 362.

This is in all probability not the *Grapsus pictus* of LATREILLE. It may be either *G. ornatus*, M. ED., or a new species; and is not improbably the same as the preceding.

Mazatlan, (M. Verreaux.)

PACHYGRAPSUS CRASSIPES. Randall.

Pachygrapsus crassipes, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 127.

Distinguished by the square form of the carapax, which has a single tooth on each side posterior to that forming the outer angle of the orbit;—the broad depressed front, and spiny tarsi. It is very common on the coast of California, south of San Francisco, and was found at the Farallone Is., (Trowbridge;) at Monterey, (Taylor;) and at San Diego, (Schott.) RANDALL states that his specimens were found at the Sandwich Is., by Nuttall. But the species has never been found there by other observers, although the Islands have been frequently and well searched for Crustacea. On the other hand, RANDALL states that his *P. parallelus* * is found on the coast of Oregon, where, however, it has not been since observed; while it is common at the Sandwich Is. It is therefore probable, that in the case of Nuttall's specimens the labels of the two species were accidentally exchanged.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Acad. Petrop.; Paris.

There seems to be no good reason why RANDALL's name *Pachygrapsus* should not be retained for the group called *Leptograpsus* by MILNE-EDWARDS. The thick, square, and evidently allied forms with a square third article of maxillipeds, for which Dr. R. instituted the genus, are quite distinct from the true *Grapsi*, though forming a group to which DE HAAN proposed to restrict the ancient name of the family. When it was found necessary to divide this group into genera, based upon the characters of the orbits and external antennæ, the name *Pachygrapsus* should certainly have been retained for one of them. That RANDALL did not describe the structure of those parts in his two species,

* *Grapsus thukuhar*, Owen; *Goniograpsus thukuhar*, Dana; *Metopograpsus thukuhar*, Milne-Edwards, Mélanges Carcinologiques, p. 131.

is no reason for rejecting it,—this was not necessary in the definition of the group. As well might we reject the name *Grapsus* itself, because we cannot determine from LAMARCK's descriptions many characters now considered important. RANDALL's first-mentioned species, *P. crassipes*, which we may consider as typical, is closely allied to the Mediterranean *Grapsus varius;* having the internal suborbital lobe widely separated from the front, admitting the external antennæ within the orbit. It therefore belongs to M. EDWARDS's division *Leptograpsus. P. parallelus* will come under *Metopograpsus*, which genus seems to be the nearest ally of *Leptograpsus*, although M. EDWARDS places *Grapsus* between them. In fact, *M. thukuhar* might well be considered an intermediate species, for the suborbital lobe is here not quite joined to the front, although approximating closely to it.

PSEUDOGRAPSUS OREGONENSIS. Dana.

Pseudograpsus Oregonensis, DANA; *U. S. Exploring Expedition, Crust.* i. 334, Pl. XX. f. 6. MILNE-EDWARDS; *Mélanges Carcinologiques*, 157. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

The *Pseudograpsi* are easily distinguished from the other *Grapsi* of this coast by the approximation of the inner margins of the outer maxillipeds, which, in the other forms, are widely separated by a rhomboidal space. The present species differs from the next in the hairiness of its feet. It is bluish-gray above, clouded anteriorly with patches of dark red dots; the feet, with the exception of the light-colored anterior pair, are sparsely dotted with red. The carapax is usually about an inch in length. The lanose spot on the hand is found in the male only.

This species occurs very abundantly on the muddy shores of sheltered bays, generally among pebbles and under stones about half-tide mark. It was found in Puget Sound, (Suckley;) Tomales Bay, (Samuels;) and in San Francisco Bay, (Ayres.)

Mus. Expl. Exped.; Bost. Soc.; Phil. Acad.; Smithsonian; Acad. Petrop.; Paris.

PSEUDOGRAPSUS NUDUS. Dana.

Pseudograpsus nudus, DANA; *U. S. Exploring Expedition, Crust.* i. 335, Pl. XX. f. 7. MILNE-EDWARDS; *Mélanges Carcinologiques,* 158. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This beautiful species may be at once recognized by the glossy smoothness of its feet. The posterior pair of feet are very short. It is of a dark purplish-red color above; the carpus and hand much lighter, and spotted. It grows to a large size;—the carapax of one specimen from Monterey measuring two inches in length, by two and two fifths in breadth. It has some resemblance to *Pachygrapsus crassipes,* which is found with it, but may be distinguished by the character of the maxillipeds and the nearly smooth tarsi. It is found among rocks at the mouths of bays, or on the open sea-coast, where the water is clear. Like the preceding it is a littoral species, and is often found near high-water mark. It was found in Puget Sound, (Expl. Exped.;) Tomales Bay, (Samuels;) San Francisco Bay, (Stimpson;) and at Monterey, (Trowbridge and Taylor.)

Mus. Bost. Soc.; Smithsonian; Acad. Petrop.

Heterograpsus marmoratus, M. EDW. (*Cyclograpsus marmoratus,* WHITE,) is perhaps identical with *P. nudus.* If so, DANA's name has priority, as no description accompanies WHITE's name in the British Museum catalogue. It is said to be found at Sitka.

GECARCINUS QUADRATUS. De Saussure.

Gecarcinus quadratus, DE SAUSSURE; *Rev. et Mag. de Zoöl.* v. 360, Pl. XII. f. 2.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

PINNIXA FABA. Stimpson.

Pinnothera faba, Dana; *U. S. Exploring Expedition, Crust.* i. 381, Pl. XXIV. f. 4.

The large palpi of the external maxillipeds in this species indicate its affinity with the *Pinnixæ.* The male resembles *P. cylindrica*, (*Pinnotheres cylindricum*, Say,) and is much smaller than the female, while the carapax is shorter and broader; its length bearing to its breadth the proportion, 1:1.8. The hands are very large, and of nearly the same shape as in the female, the finger being, however, considerably more curved.

♂	Length of carapax,	0.36 inch;	breadth,	0.65.
♀	"	"	0.69 "	"	1.05.

Found in the large *Lutraria* of the Oregon coast. Puget Sound, (Expl. Exped.;) Shoalwater Bay, (Cooper.)

Mus. Smithsonian; Expl. Exped.

FABIA SUBQUADRATA. Dana.

Fabia subquadrata, Dana; *U. S. Exploring Expedition, Crust.* i. 382, Pl. XXIV. f. 5.

Distinguished from the preceding by its greater proportional length.

Puget Sound, (Expl. Exped.;) Farallone Is. (Trowbridge.)

Mus. Expl. Exped.; Smithsonian; Phil. Acad.

Tribe OXYSTOMATA.

CALAPPA CONVEXA. De Saussure.

Calappa convexa, De Saussure; *Rev. et Mag. de Zoöl.* v. 362, Pl. XIII. f. 3.

Mazatlan, (Verreaux.)

LEUCOSILIA JURINII. Bell.

Guaia Jurinii, De Saussure; *Rev. et Mag. de Zoöl.* 1853, v. 365, Pl. XIII. f. 4.
Leucosilia Jurinii, Bell; *Trans. Linn. Soc.* xxi. 295, Pl. XXXII. f. 1.

Mazatlan, (Verreaux.)
Mus. Brit.

RANDALLIA. nov. gen.

Carapax ovalis, subglobosus, ferè lævis, politus, dentibus duobus posticê armatus. Regiones pterygostomiani angulati. Frons angustata sed crassa, in medio concava. Orbita trifissa. Fossæ antennariæ parvæ, obliquæ, altissimæ. Antennarum internarum articulus basalis operculiformis, fossam claudens et partem super-mobilem retractam antennæ celans. Epistoma ex comparatione ampla. Maxillipedes et pedes ut in *Persephonâ.*

The species upon which this genus is founded was placed in *Ilia* by Randall, and in *Guaia* (*Persephona*) by Gibbes. Its characters will, however, exclude it from both of these genera, although it approaches closely to the latter in its general appearance. The following are its distinctive features. The carapax is not depressed, and is armed with but two teeth posteriorly; the surface is mostly smooth and ungranulated. Anterior extremity thick. Antennary fossæ small, oblique, and very deep. Basal article of internal antennæ somewhat expanded, operculiform, almost completely closing the aperture of the fossa when the antenna is retracted within it. The fossæ do not immediately border on the buccal margin as in *Persephona*, but are separated from it by a considerable space, so that the epistoma presents a greater surface than is usual in the family.

RANDALLIA ORNATA. Stimpson.

Plate XIX. f. 3.

Ilia ornata, Randall; *Jour. Acad. Nat. Sci. Philad.* viii. 129.
Guaia ornata, Gibbes; *Proc. Am. Assoc.* 1850, p. 186.
Randallia ornata, Stimpson; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

In this species there are generally a few granules on the stomachal region anteriorly, and on the intestinal poste-

riorly. There may be either several small granules or one large one only, on the margin between the posterior teeth.

Upper California, (Nuttall.)

Mus. Phil. Acad.; Smithsonian.

DECAPODA ANOMOURA.

TRIBE LITHODEA.

CRYPTOLITHODES TYPICUS. Brandt.

Plate XX.

Cryptolithodes typicus, BRANDT; *Bulletin physico-mathém. de l'Académie de St. Petersb.* 1849, vii. 175.

As BRANDT's description of this remarkable crab is unaccompanied by a figure, and very short,—the general characters of the clypeus, rostrum, and antennary appendix only being given,—I take the present opportunity of presenting figures, and a detailed description, drawn up from a specimen (a female) sent in a dried state to the Smithsonian Institution by Mr. Taylor of Monterey. As the dismemberment of this most rare and unique example would be by no means desirable, the details of the inner maxillipeds, and of some other less conspicuous appendages, cannot be here given.

The most striking characteristic in this species is the great development of the carapax, which forms a broad, thin shield, of very uneven surface, completely hiding the legs, antennæ, abdomen, and all the inferior parts of the body. These parts, therefore, which form a great portion of the bulk in most crabs, seem here, when viewed from below, to be placed in the bottom of a cup-like cavity. This arrangement would lead one to refer the species to the *Cryptopodiaceæ*, to which family however it has no resemblance in its other characters; the structure of the antennæ, the position of the eyes, and the concealment of the posterior pair of feet at once distinguishing it.

The superior surface of the carapax is raised into a high ridge along the median line, deeply sinuated between the stomachal and cardiac regions, the former of which is a little shorter and less prominent than the latter. The branchial regions are rather small, and much less prominent than the cardiac. The intestinal is continuous with the cardiac posteriorly. The wings or lateral portions of the shield are broadly expanded, subtriangular; their extremities covering the terminal joints of the third pair of feet extended. The surface is rugose at the prominent parts, but generally smoothish and ungranulated, although discolored and having a somewhat eroded appearance. The rostrum is lamelliform, rectangular, pointing downwards at an angle of about 60° with the horizontal axis;—its truncate extremity is still more deflected and slightly emarginate at the middle.

The arrangement of the eyes, antennæ, and other parts in the vicinity of the mouth, is generally similar to what we see in *Echidnocerus* and other genera of the family. The ocular peduncles are closely approximated at their base, and are rather long, allowing the eyes at their tips to be seen from above in the angle between the base of the rostrum and the anterior margin of the carapax, which constitutes the only vestige of an orbit. The internal antennæ are slender, inserted behind the base of the ocular peduncles, and much within the margin of the carapax; they are directed forward between the eyes, and terminate in a slender, hairy, multiarticulate flagellum, longer than the penultimate article, and not reaching the extremity of the rostrum. The external antennæ occupy the hiatus between the anterior margin of the almost vertical pterygostomian plates, and the exterior bases of the internal antennæ. Their second article is broadly expanded, and bears a lamelliform appendix which equals it in size, projecting much beyond it exteriorly, and reaching the margin of the carapax; both are of large size, and bear short, blunt hairs on their lower

or exposed surface, their upper sides being pressed against the carapax. The terminal flagellum is very long and slender, compressed, of nearly the same width throughout, and consists of about twenty-two articles, each bearing two clavate setæ.

The external maxillipeds are rather broad, and have their outer surfaces flattened, with sharp, projecting, lamellar edges. They resemble those of the *Brachyoura* much more closely than do those of other members of the tribe. The last two articles are, however, well developed. The basal article is of great width, expanded exteriorly, and bearing at its antero-internal angle the second, small, with bilobate inner margin; the third is elongated, and presents a triangular face. The surfaces of all these points are covered with the short, clavate hairs so peculiar in this species.

The feet of the first or anterior pair are very unequal in size, the right hand being much the larger. Their second and third joints bear a sharp longitudinal crest inferiorly, against which the margin of the hand rests when retracted; the second joint also bears a sharp compressed tooth above, near its articulation with the third, which also bears a still larger and more prominent tooth almost continuous with that on the second. The larger hand is broad, convex, with about six tuberculous ridges on the outer surface, and a strong projection above at the articulation of the short, stout finger, which is also ridged, and bears a crest above. The surface of contact between the thumb and finger is broad, with its margin scarcely dentate. The feet of the second, third, and fourth pairs, about equal in size, are strongly compressed, almost lamelliform, and sharply crested above for most of their length. Those of the fifth pair are concealed beneath the carapax, (or rather beneath the abdomen,) and are nearly the same in size and structure as in the other genera of the tribe. We may remark, however, that the three articles forming the terminal portion of these feet are of greater length and more slender than is usual;—

when drawn out they reach the fourth joint of the preceding pair.

The abdomen is flattened, and without spines or tubercles. In the female it is symmetrical externally, although provided with ovigerous legs on the left side only. The basal (second) article is undivided, arched, broad and concave. The three following each consist of a convex, quadrilateral, tergal piece, transversely ridged across the middle, and the lateral or epimeral pieces, which are placed obliquely, and are wider than long, with their margins raised, and their surface depressed. The sixth article is unprovided with epimeral pieces; it is longer than the preceding ones, of a trapezoidal shape, its sides joining the posterior edges of the epimera of the article next preceding; its broader terminal side is deeply sinuated for the reception of the seventh article. This latter is very small, triangular, and fits between the basal joints of the anterior pair of feet when the abdomen is in place.

The color was reddish beneath; above indistinct. The dimensions of the specimen above described are: length, 1.16; breadth, 1.85 inch. Proportion, 1:1.60. The dimensions of Brandt's specimen were: length, 1.33; breadth, 1.91 inch. Proportion, 1:1.43.

The Smithsonian specimen was found by Mr. Taylor on surf-washed rocks near low-water mark, on the beach of Monterey. It is desirable that other specimens should be secured and well preserved in spirits, in order that the anatomy, and particularly the arrangement of the branchiæ, and the structure of the lateral apodemes can be observed. It is obvious that this genus most strongly represents the Brachyoura in the section to which it belongs. The carapax, usually of moderate or small size in the Anomoura, is here developed to a degree unequalled in any of the higher Decapods, not excepting even *Cryptopodia* and *Œthra.* It is indeed the only instance in which the cephalo-thorax entirely conceals the feet; in all other genera the anterior pair at least being seen from above.

The specimen described by Brandt was taken by Wosnessenski on the coast of Upper California, and is in the Museum of the Academy of St. Petersburg.

CRYPTOLITHODES SITCHENSIS. Brandt.

Cryptolithodes Sitchensis, BRANDT ; *Mélanges Biologiques*, i. 654.

Differs from the preceding in its smooth hands, and tridentate frontal margin of the rostrum.

Hab. Sitka.

PHYLLOLITHODES PAPILLOSUS. Brandt.

Phyllolithodes papillosus, BRANDT ; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 175.
Petalocerus Bellianus, WHITE ; *Proc. Zoöl. Soc.* 1856, 134.

I have with some doubt referred the curious *Lithodes* recently described by Mr. WHITE, to the *Phyllolithodes papillosus* of BRANDT. The descriptions, as far as they go, are in no respect inconsistent ; but unfortunately for comparative investigation, the authors have for the most part described different parts of the crab. WHITE's figure is not yet published.

This species I have not met with.

Hab. Is. of Kadjak, (Wosnessenski ;) Coast of California, (Lobb.)

Mus. of Prof. Bell ; Acad. Petrop.

RHINOLITHODES WOSNESSENSKII. Brandt.

Rhinolithodes Wosnessenskii, BRANDT ; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 174.

This may perhaps be the young of some other species.

Hab. Sitka, Kadjak, (Wosnessenski.)

Mus. Acad. Petrop.

ECHIDNOCERUS CIBARIUS. White.

Echidnocerus cibarius, WHITE; *Proc. Zoöl. Soc.* 1848, 47. Annulosa, Pl. II. III. *Brit. Mus. Cat.* Crust. 56.

Lopholithodes Mandtii, BRANDT; *Bulletin phys.-mathém. de l'Académie de St. Pétersboury*, 1849, vii. 174.

The dimensions of the carapax in a specimen from Sitka are: length, 6.90; breadth, 8.35 inch.

The members of this remarkable genus are among the largest crabs known. They do not indeed cover so much space as do many of the *Maiaceæ* with their legs extended; but their carapax is nearly as large, and their weight greater than even in the *Macrocheira* of Japan. Specimens have been taken the weight of which exceeded seven pounds; the diameter of the carapax being over ten inches.

The species *E. cibarius* was found at the mouth of the Columbia by Sir George Simpson; and at Sitka by Wosnessenski, Trowbridge, and the North Pacific Expedition.

Mus. Brit.; Acad. Petrop.; Smithsonian.

ECHIDNOCERUS SETIMANUS. Stimpson.

Ctenorhinus setimanus, GIBBONS; *Proc. Cal. Acad. Nat. Sci.* i. 48, (1855.)

Echidnocerus setimanus, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This species most closely resembles the preceding, and will perhaps prove the same when direct comparisons of specimens of the same age and sex can be instituted. I have before me a considerable number of specimens both of the Sitka and the California species, but those from the former locality are all males, and those from the latter, as it unfortunately happens, are all females. There are, however, some differences which may prove constant. In the Californian (female) specimens, the spines of the carapax, rostrum, feet, etc., are everywhere blunt, being rather tubercles than spines; the carapax is proportionally broader, and the greatest transverse diameter is at the large postero-lateral

tubercles, instead of at the first pair of antero-lateral teeth, (S of Dana.) In these females the characters of the abdomen usual in female *Lithodinæ* are prominently shown, the terminal apex being turned considerably to the right of the median line of the body; there are no marginal plates on the left side, where the greater mass of the ova are placed, the ovigerous feet being wanting on the right side with the exception of that of the first pair.

The dimensions of three specimens are as follows:—

Loc.		Length of Carapax.	Width.	Proportion.
San Francisco,	♀	4.72 inch.	5.31 inch.	1:1.13 inch.
" "	♀	5.58	6.30	1:1.13
? (Gibbons)	?	10.00	10.25	1:1 03

All the specimens yet found were taken off the mouth of San Francisco Bay, and near the Farallone Rocks. They have been brought to the market of the city by fishermen, who are encouraged to preserve them when caught, by the high prices (from five to ten dollars) at which they are easily sold.

Mus. Cal. Acad.; North Pacific Expedition.

LITHODES SPINOSISSIMUS. Brandt.

Lithodes spinosissimus, Brandt; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 173.

The members of the tribe *Lithodea* may easily be distinguished by the apparent want of the fifth pair of feet, which are very small, and always folded up over the back and concealed beneath the carapax. The present species may be recognized by the very numerous long sharp spines with which it is everywhere covered above.

Hab. Kadjak, (Wosnessenski.)

Mus. Acad. Petrop.

LITHODES BREVIPES. Edwards et Lucas.

Lithodes brevipes, EDWARDS et LUCAS; *Archives du Museum*, ii. 463. Pl. XXIV–XXVII. BRANDT; *Bulletin phys.-mathém. de l'Acad. de St. Pétersb.* vii. 173. *Sibirische Reise, Zoölogie*, i. 99.

In this species the feet are shorter than is usual in the genus, and there are few spines on the body, all of moderate length.

Hab. Unalaschka, (Wosnessenski.)

Mus. Paris; Acad. Petrop.

LITHODES CAMTSCHATICUS. Latreille.

Lithodes Camtschaticus, LATREILLE; in *Cuvier's Regne Animal*, 2d ed. iv. 65. MILNE-EDWARDS; *Hist. Nat. des Crust.*, ii. 187. BRANDT; *Sibirische Reise, Zoölogie*, i. 94.

Hab. Atcha, Unalaschka, (Wosnessenski.)

Mus. Acad. Petrop.

TRIBE HAPALOGASTRINEA.

This remarkable tribe, although resembling much the *Porcellanidea* in general appearance, appears to be correctly placed between the *Lithodea* and the *Paguridea*. The distinguishing character consists in the structure of the abdomen, which, although broad and reflexed below the abdomen, is soft as in the hermit crabs; the basal and terminal articles only being provided with a hard coating. De Haan's *Lomis dentata* seems to belong to this tribe. The true *Lomis*, as described by Milne-Edwards, has a hard and crustaceous abdomen, as in *Lithodes* and *Porcellana*.

This tribe was first defined by BRANDT, the distinguished zoölogist of St. Petersburg. He describes two species, both from the northwest coast of America. The most common crab found on the shores of Jesso, one of the Japanese

islands, belongs to this division. They live under flat stones, from half-tide to low-water mark, and represent the *Porcellanæ* of warmer latitudes.

DERMATURUS MANDTII. Brandt.

Dermaturus Mandtii, BRANDT; *Mélanges Biologiques*, i. 57.

Hab. Island of St. Paul.
Mus. Acad. Petrop.

HAPALOGASTER MERTENSII. Brandt.

Hapalogaster Mertensii, BRANDT; *Mélanges Biologiques*, i. 58.

Hab. Sitka, (Wosnessenski.)
Mus. Acad. Petrop.

TRIBE PORCELLANIDEA.

PORCELLANA EDWARDSII. De Saussure.

Porcellana Edwardsii. DE SAUSSURE; *Rev. et Mag. de Zoöl.* v. 366. Pl. XI. f. 3.

Carapax strigose; surface of hands scabrous; anterior margin of carpus in the first pair of feet, and of the third article in the remaining pairs, strongly toothed.

Hab. Mazatlan, (Verreaux.)
Mus. Paris.

PORCELLANA RUPICOLA. Stimpson.

Plate XIX. f. 2.

Porcellana rupicola, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

Carapax moderately depressed; front triangular, considerably deflected, with a blunt extremity, and a notch or groove at the base separating it from the orbit. Surface of the feet and anterior half of the carapax scarcely rugose, with granules but slightly prominent. The portion of the

upper surface between the eyes is depressed, with a shallow median groove. Ocular peduncles broad; eyes small. Superior margin of orbit somewhat concave. External antennæ one and a half times as long as the carapax; flagella with few setæ, some of which are twice as long as the width of the flagellum. Anterior feet very large and broad; margins smooth; carpus scabrous on its infero-exterior surface, and conspicuously granulated above, along the slightly elevated ridge forming its outer margin, which terminates anteriorly in a tooth. The surface of the carpus near its somewhat projecting, rounded, postero-interior angle, is also granulated. Pincers smooth, with somewhat hooked extremities. Second, third, and fourth pairs of feet of moderate size; fourth joint with a slight ridge along the middle of the upper surface; fifth joint and tarsus provided with tufts of hair, which are most conspicuous in the fourth pair of feet, in which pair the fourth joint also has sometimes one or two small tufts near its extremity.

Color, dark purplish-red. Length of carapax in a male specimen, 0.85; breadth, 0.80; length of hand, 1.47; breadth, 0.64 inch.

Its affinities are with *P. valida*, *violacea*, and *granulosa*. It is easily distinguished from the preceding species by the smooth anterior margin of its carpus.

It is very common among the rocks of the Californian coast, preferring an open shore, with clear water. It is littoral in its habits, and is usually found at about half-tide mark. It was taken at the Farallones and at San Luis Obispo by Lieut. Trowbridge; at Monterey by Mr. Taylor.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian.

Tribe PAGURIDEA.

EUPAGURUS MIDDENDORFFII. Brandt.

Pagurus (Eupagurus) Middendorffii, Brandt; *Sibirische Reise, Zoölogie*, i. 108. Pl. V. f. 1.

Hab. Sitka, (Wosnessenski.)
Mus. Acad. Petrop.

EUPAGURUS SAMUELIS. Stimpson.

Eupagurus Samuelis, Stimpson; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

Front acute at the middle. Outer antennæ articulated at the extreme antero-exterior corners of the carapax; extremity of terminal article of peduncle reaching much beyond the eyes; flagellum reaching the extremity of the larger hand. Anterior feet very unequal in size, the right being much the longer and stouter; carpus and hand granulated; larger hand nearly twice as long as broad; finger less than half as long as the hand, with a slight crest not conspicuously denticulated. Left hand narrower than its carpus, which has a slightly prominent double crest. Feet of the second and third pairs very slender, somewhat hairy; the right foot of the second pair longer than that of the first pair. Color yellowish. Length three fourths of an inch.

This is a very small species, found in shells of the genera *Nassa*, *Littorina*, etc. It most resembles *E. tenuimanus*, from which, however, it may be distinguished by its more oblong, non-cristate hand. From *E. Middendorffii* it differs in the more prominent granulation of its anterior feet, and the more numerous and smaller teeth on the inner margin of the thumb and finger.

It was taken in Tomales Bay, near low-water mark, by Mr. Samuels, to whom I have dedicated the species, as a memorial of his labors in this department of science. It is in the Museum of the Smithsonian Institution.

EUPAGURUS BERNHARDUS. Brandt.

Pagurus Bernhardus, FABR.; *Entom. Syst.* ii. 469.
Pagurus streblonyx, LEACH; *Mal. Pod. Brit.*, Pl. XXVI. f. 1.
Pagurus (Eupagurus) Bernhardus, BRANDT; *Sibirische Reise, Zoölogie*, i. 106.
Bernhardus streblonyx, DANA; *Proc. Acad. Nat. Sci., Philad.* 1852, vi. 6.

This is an Arctic species, found on both shores of the continent.

Hab. Unalaschka, (Wosnessenski.)

Mus. Acad. Petrop.

Brandt's name *Eupagurus* has priority over *Bernhardus* of Dana by a few weeks only; the former appearing in a work the printing of which was finished (as appears from the reverse of title-page) Sept. 30, 1851; while Dana's name was presented at the Philadelphia Academy's meeting of the same date, and could not therefore have been printed until October.

EUPAGURUS MERTENSII. Brandt.

Pagurus (Eupagurus) Mertensii, BRANDT; *Sibirische Reise, Zoöl.* i. 112.

Differs from *E. Bernhardus* in its longer and more slender chelæ.

Hab. Kadjak, Nootka Sound, and coast of Upper California, (Wosnessenski.)

Mus. Acad. Petrop.

EUPAGURUS TENUIMANUS. Stimpson.

Bernhardus tenuimanus, DANA; *U. S. Exploring Expedition, Crust.* i. 447. Pl. XXVII. f. 7.

The hands in this species are very unequal; the larger one is short and broad, but thin, and granulose. Carapax and feet all without pubescence.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

EUPAGURUS ARMATUS. Stimpson.

Bernhardus armatus, DANA ; *U. S. Exploring Expedition, Crust.*, i. 442. Pl. XXVII. f. 2.

Distinguished by its spinulose feet, which, together with the carapax, are apparently destitute of hair.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

EUPAGURUS HIRSUTIUSCULUS. Stimpson.

Bernhardus hirsutiusculus, DANA ; *U. S. Exploring Expedition, Crust.*, i. 443. Pl. XXVII. f. 3.

Differs from *E. Mertensii* in its proportionably longer tarsi. Body everywhere hairy.

Hab. Dungeness, Puget Sound, (Expl. Exped.)

Mus. Expl. Expedition.

CLIBANARIUS TURGIDUS. Stimpson.

Plate XXI. f. 1.

Eupagurus turgidus, STIMPSON ; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

Carapax rough, hairy, scabrous at the sides. Front broad, with an acute point at the middle, and one on either side, between the bases of the outer antenna and the peduncle of the eye. Antennæ very hairy ; inner ones three fourths as long as the outer ones, which are shorter than the carapax. Eyes at the extremities of rather long, slender peduncles, reaching the extremity of the terminal joint of the peduncle of the outer antennæ. Chelopoda equal, rather short, covered above with short spines and tufts of long hair ; hands short and very thick, strongly tumid below ; finger about half as long as the hand ; both finger and thumb with a few calcareous teeth near the base on the surface of contact, and a sharp, corneous, minutely denticulated

cutting edge near the extremity. Feet of the second and third pairs nearly equal; those on the right side sometimes slightly the longer; all spinulose and very hairy throughout their length. Tarsi much longer than the penult joint. Color yellowish, obscured by the hirsute covering; eye peduncles and internal antennæ with a longitudinal streak of crimson. Length about three inches.

It differs from *C. æquabilis* in its longer tarsi, greater size, and less variegated coloration. It may be distinguished from the other Oregon Paguri by its equal hands and hairy tarsi.

Found in large shells of the genera *Buccinum*, *Tritonium*, etc., in Puget Sound. The specimens described were collected by Dr. Suckley.

Mus. Smithsonian.

CLIBANARIUS ÆQUABILIS. Dana.

Clibanarius æquabilis, DANA; *U. S. Exploring Expedition, Crust.*, i. 464. Pl. XXIX. f. 4.

C. æqualis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

Hab. California, (Dr. Le Conte.)

Mus. of Prof. Dana.

TRIBE HIPPIDEA.

ALBUNEA LUCASII. De Saussure.

Albuminea Lucasia, DE SAUSSURE; *Rev. et Mag. de Zoöl.* v. 367. Pl. XII. f. 4.

This species, according to M. DE SAUSSURE, differs from *A. symnista* in having the anterior margin of the carapax less sinuous, and in its long, styliform ocular peduncles, which are closely approximated at the base, leaving the angle between them very acute and narrow.

Hab. Mazatlan, (Verreaux.)

Mus. Phil. Acad.

BLEPHAROPODA OCCIDENTALIS. Randall.

Blepharipoda occidentalis, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 131. Pl. VI. GIBBES; *Proc. Am. Assoc.* 1850, p. 187.
Albunhippa occidentalis, DANA; *U. S. Exploring Expedition, Crust.* i. 404.

Blepharopoda is a well-marked genus first instituted by RANDALL in 1839; and subsequently named *Albunhippa* by MILNE-EDWARDS in the *Archives du Musèum d'Histoire Naturelle*, Vol. II. (1841.) The name *Blepharopus* occurs in Entomology; but this is scarce near enough to RANDALL's term to warrant its rejection.

Hab. San Diego, (Nuttall.)

Mus. Phil. Acad.

HIPPA ANALOGA. Stimpson.

Hippa emerita, DE SAUSSURE; *Rev. et Mag. de Zoöl.* v. 367.
Hippa talpoidea, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.
Hippa analoga, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

In an examination of a great number of specimens of the common Californian *Hippa*, and a careful comparison of them with specimens from all parts of the eastern coast of the United States, I find differences which are so constant, that it is not difficult to determine at a glance, with regard to any specimen, whether it be from the eastern or western side of our continent. This being the case, I have been led to propose a new name for the western species.

It differs from *H. talpoidea* in the following characters. It is much broader,—the breadth of the carapax being to its length as 1 to 1.29; against 1:1.43 in *H. talpoidea*. It is more depressed, and the back is much less arched and convex, along the middle. In *H. talpoidea* the posterior margin of the carapax is concave on each side, and its postero-inferior corner forms a lobe-like projection; while in our species the margin is straight and forms no projection. In *H. talpoidea* the upper surface is rugose only toward the extremities,

chiefly the anterior one, while it is smooth in the middle;—in our species it is generally everywhere rugose, except at the postero-inferior wings, and much more so anteriorly than in the other species. In female individuals of equal length, the terminal segment of the abdomen is one sixth longer in *H. talpoidea* than in *H. analoga*. Finally there are slight differences in the details of the feet and antennæ, not as well marked, however, nor as constant as those of the carapax. One of the most prominent of these is in the spines of the acicle or appendicular scale of the outer antennæ, which in our species are somewhat longer, more slender, and more curved, than in the eastern one.

Compared with *H. emerita*, the teeth of the frontal margin of the carapax are found to be much less acute than in that species; the spines of the acicle are not as long, and are curved inward instead of outward.

It is of a bluish or cinereous color above, and yellowish-white below; the fringing hairs are mostly black. The dimensions of a female specimen from Tomales Bay are as follows: length of carapax, 1.19; breadth, 0.91.

It inhabits sandy beaches on the open coast.

Hab. Tomales Bay, (Samuels;) near San Francisco, (Trowbridge;) Monterey, (Taylor;) and Mazatlan, (Verreaux.)

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Paris; Acad. Petrop.

TRIBE GALATHEIDEA.

GRIMOTEA GREGARIA. Leach.

Galathea gregaria, FABR.

Grimotea gregaria, LEACH; *Dict. des Sci. Nat.* xviii. 50. OWEN; *Zoöl. of Beechey's Voy.* p. 87. See figure in DANA's Report on the Crustacea of the Exploring Expedition, Atlas, Pl. XXXI. f. 1.

A pelagic species, found swimming at the surface off the coast of California by the naturalists of the "Blossom."

Mus. Zoöl. Soc. of London.

DECAPODA MACROURA.

Tribe THALASSINIDEA.

GEBIA PUGETTENSIS, Dana.

Plate XXI. f. 2.

Gebia Pugettensis, Dana; *U. S. Exploring Expedition, Crust.* i. 510, Pl. XXXII. f. 1.
Gebia Californica, Stimpson; *Proc. Cal. Acad. Nat. Sci.* i. 88.

The *Gebia* may be distinguished from the other fossorial Macroura of this coast, by its rough, hairy rostrum, and equal anterior feet.

The thumb in this species (see the figure) is considerably curved, and bears on its inner side a strong tooth. This tooth is a prominent character in all the very numerous specimens in the Smithsonian Museum, but is obsolete in the specimen described by Dana, although actual comparison shows them to be the same. The species attains a large size, the dimensions of an Oregon specimen being as follows :—

Length of the animal		4.00	inches
"	" carapax	1.38	"
"	" hand	1.00	"
Width	" carapax	.80	"
"	" abdomen	1.05	"
"	" hand	.46	"

A curious parasitic bivalve, apparently new, both in genus and species, is frequently found adhering by its byssus to the inner surface of the abdomen of this crustacean. It approximates in character to the genus *Lepton.*

Gebia Pugettensis is found on the whole coast from Puget Sound to Monterey. It excavates its subterranean chambers in the sand and mud of beaches, near low-water mark, preferring that which is more or less indurated.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Expl. Exped.; Acad. Petrop.

CALLIANASSA GIGAS. Dana.

Plate XXI. f. 3.

Callianassa gigas, DANA; *U. S. Exploring Expedition, Crust.* i. 512. Pl. XXXII. f. 3.

The *Callianassæ*, like the *Gebiæ*, lead a subterranean life, and by these are formed the numerous holes, half an inch or more in diameter, which may be observed on most sandy beaches. They may be distinguished by their thin, soft shell, and smooth, glossy carapace. One of the hands is invariably much larger than the other, and this may be either the right or left in the same species. In *C. gigas* the larger hand is remarkably short and stout. Length, often five inches.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

CALLIANASSA CALIFORNIENSIS. Dana.

Plate XXI. f. 4.

Callianassa Californiensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. p. 175.

Callianassa occidentalis, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

Eye-peduncles subtriangular, closely approximated at their bases, but diverging and curving a little upward at their pointed tips. Length of the external antennæ two thirds that of the body. The larger of the anterior feet is smooth and glossy on the sides, and ciliate along the edges. Hand broadest at the base, but little longer than the carpus and much less in breadth. A considerable hiatus intervenes between the fingers when closed, and between their bases

arises a small but prominent blunt tooth, which curves upward. Movable finger half as long as the hand, with hooked extremity; inferior edge swelling out near the base, and minutely denticulated. Both fingers hirsute with scattered tufts of hair. Color of the body a delicate orange; anterior feet rose-colored. Length, three inches. The proportional dimensions as compared with the other species, will be given in the table under *C. longimana.* In this species, I have seen only one case in which the left hand is the larger.

Hab. San Francisco Bay, near its mouth, (Trask;) Fort Steilacoom, Puget Sound, (Suckley.)

Mus. Smithsonian; Cal. Acad.

CALLIANASSA LONGIMANA. Stimpson.

Plate XXI. f. 5.

Callianassa longimana, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

A slender species, closely allied to the preceding, from which it may be distinguished by the following characters: It is more slender and elongated, and grows to a larger size, being often four inches in length. The outer maxillipeds are less broad. The larger foot of the anterior pair, (see figure,) which is most frequently on the left side, is more slender and less hairy than in the preceding species, with the hand much longer and of equal breadth with the carpus. In our species the carpus is shorter than the *body* of the hand, while in *C. Californiensis* it is longer. In the smaller chelopod, the fingers are of equal length in our species, while in *C. Californiensis* the finger exceeds the thumb in length. With *C. gigas* our species would never be confounded on account of the great difference in the length of the hand. The three species resemble each other very much, however, in general appearance and characters other than those derived from the chelopoda. The following table will show their relative proportions:—

	C. gigas.	*C. Californiensis.*	*C. longimana.*
Length of the body from anterior extremity of carapax to end of caudal segment	1.	1.	1.
Length of carapax	.24	.28	.24
Breadth of do.	.16	.21	.16
Breadth of abdomen at 3d segment	.20	.22	.19
Length of caudal segment . . .	.10	.13	.11
Length of larger chelopod	.55	.81	.70
" " brachium	.12	.18	.12
" " carpus	.11	.24	.15
" " body of hand	.12	.13	.16
" " finger	.06	.14	.12

C. longimana was found in considerable numbers at Fort Steilacoom, Puget Sound, by Dr. Suckley.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian.

TRIBE ASTACIDEA.

PANULIRUS INTERRUPTUS. Stimpson.

Palinurus interruptus, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 137. GIBBES; *loc. cit.* p. 194.
Panulirus interruptus, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This is the common "lobster" of the San Francisco market; and is the *langouste* of the French. It inhabits rocky ledges in rather deep water, and is taken in considerable numbers by the fishermen at Santa Barbara and other ports on the coast south of San Francisco. North of this point it is never found. The traps, or "pots" used in their capture are similar to those in which lobsters are taken on the New England coast, consisting of a strong wooden basket, with a funnel-shaped entrance projecting inwards. The bait used, however, is generally meat of some kind rather than fish.

Mus. Phil. Acad.; Smithsonian.

A species of *Panulirus* in the British Museum is said to have been brought from Sitka,—a very high latitude for this genus, if the locality is correct. It is catalogued as *P. sulcatus*, which is an East Indian species.

ASTACUS GAMBELII. Agassiz.

Cambarus Gambelii, GIRARD; *Proc. Acad. Nat. Sci. Philad.* 1852, vi. 90.
Astacus Gambelii, AGASSIZ; *Proc. Acad. Nat. Sci. Philad.* 1853, vi. 375.

This species may be distinguished by the partly pilose upper surface of its chelæ, and the convex serrated margins of its rostrum, which has no distinct antero-lateral teeth or angles.

Hab. California, (Gambel.)

Mus. Phil. Acad.; Smithsonian.

ASTACUS NIGRESCENS. Stimpson.

Astacus nigrescens, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

Rostrum concave above; margins nearly parallel, denticulated with five or six small sharp spines on either side. Thoracic spines of the anterior pair rather long; a pair of minute spines between them and the posterior pair. Dorsal area between the branchial regions about as wide as in *A. Gambelii.* Hands smaller and less broad than in the preceding species; surface without pubescence. The sides of the abdominal segments (lateral projections of the dorsal arch) are sharply triangular. Color blackish. The following are the dimensions of a male specimen:—

Length of body	3.10 inches
" carapax	1.60 "
Width of "	.83 "
Length of rostrum	.40 "
" terminal of spine of rostrum	.15 "
" hand	1.25 "
Width of "	.45 "

Hab. California. My specimens were purchased in the market of San Francisco.

Mus. Smithsonian.

ASTACUS LENIUSCULUS. Dana.

Astacus leniusculus, DANA; *U. S. Exploring Expedition, Crust.* i. 524. Pl. XXXIII. f. 1.

May be recognized by its well-developed thoracic spines, and light color.

Hab. Columbia River, (Expl. Exped.;) Puget Sound, (Expl. Exped., and Dr. Suckley.)

Mus. Expl. Exped.; Smithsonian.

ASTACUS TROWBRIDGII. Stimpson.

Astacus Trowbridgii, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

This large species has a general resemblance to *A. leniusculus.* It differs from that species in having much less prominent thoracic spines, the posterior pair of which is here but little developed, even in adult specimens. The rostrum is also somewhat shorter and broader than in the preceding species, with smooth, nearly parallel sides; terminal tooth of moderate length; antero-lateral teeth sufficiently prominent. Dorsal area broader than in *A. Gambelii*, but narrower than in *A. leniusculus.* Hands large, robust, equal in size; surface rough; fingers spinulose. A prominent sharp spine on the superior edge of the brachium near its extremity.

This species is of a reddish-olive color in preserved specimens, probably much darker in life. The color of the chelæ is much darker than that of the body. The dimensions of a male specimen are as follows:—

Length of body	4.80 inches
Breadth "	1.30 "
Length of rostrum	.50 "
" terminal tooth of rostrum	.18 "
" hand	2.60 "
Breadth of "	1.15 "

This species was found abundantly near Astoria by Lieut. Trowbridge. It occurs sometimes in brackish water, as I am informed by Dr. Cooper.

Mus. Bost. Soc.; Smithsonian; Paris; Acad. Petrop.

ASTACUS KLAMATHENSIS. Stimpson.

Astacus Klamathensis, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

A small species with a smooth carapax; thorax somewhat contracted in front. Thoracic spines of the anterior pair very small; those of the posterior pair obsolete. Rostrum small; margins smooth, converging; antero-lateral teeth sufficiently distinct; terminal tooth short. Dorsal area broad. Anterior feet with rather small, smoothish hands; inferior edge of arm less strongly dentated than in the other species. Sides of the abdominal segments broadly rounded, scarcely at all angular at the middle. The minute lateral spines of the caudal segment are rather short and stout. Color, in preserved specimens, yellowish-white, clear and bright; hand slightly tinted with olive or bluish. The dimensions of a female specimen are as follows:—

Length of body	3.00	inches
" carapax	1.38	"
" rostrum	.29	"
" terminal tooth of rostrum	.10	"
" hand	.90	"
Breadth of "	.40	"

It may be distinguished from the preceding species by its lighter color, shorter and somewhat tapering rostrum, less developed spines, and smaller hands. It was found in Klamath Lake by Dr. Newberry.

Mus. Smithsonian

ASTACUS OREGANUS. Randall.

Astacus Oreganus, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 138, Pl. VII.
ERICHSON; *Archiv für Naturgeschichte,* 1846, i. 375.
Cambarus Oreganus, GIRARD; *Proc. Acad. Nat. Sci. Philad.* 1852, vi. 87.

Dr. RANDALL's single specimen of this species was unfortunately lost by the artist employed in delineating it. No other example has since been found, although its locality has been since repeatedly searched. If the figure in the eighth volume of the Journal of the Philadelphia Academy is correct, this is a very remarkable species, differing from all others known, in possessing a median thoracic spine as well as in the length of the terminal rostral tooth; and above all in the singular lateral appendages of the abdominal segments.

Hab. Columbia River, (Nuttall.)

NEPHROPS OCCIDENTALIS. Randall.

Nephrops occidentalis, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 139.
GIBBES; *Proc. Am. Assoc.* 1850, p. 195.

This curious lobster-like crustacean may be recognized by the three rows of spines on the dorsal surface of the carapax. It is a marine species, and grows to a length of six inches. It was found on the "West Coast of America," by NUTTALL. The fine specimen in the cabinet of the Philadelphia Academy is the only one yet known.

TRIBE CARIDEA.

CRANGON FRANCISCORUM. Stimpson.

Plate XXII. f. 5.

Crangon Franciscorum, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* 1856, i. 89.

This species is more slender and depressed than is usual in the genus. Rostrum small, subtriangular, rounded in front. Spines of the thorax nearly as in *C. vulgaris.* Hand

large, (see figure,) with an oblique palm, more nearly longitudinal than transverse, occupying nearly one third of the length of its inner side; thumb-like process long and spiniform. Sternal spine long, and followed by two or three sharp tubercles on the succeeding thoracic segments. A small sharp spine on each side of the abdomen at the supero-lateral angle of the antepenultimate segment. Caudal segment long, slender, and pointed, smoothly rounded above. Color light and dark yellowish-gray, mottled. Eyes salmon-colored in life. Length about three inches.

The peculiar character of the hand in this species will enable it to be readily distinguished from all others.

This is the common shrimp of the San Francisco market. It is found very abundantly in the sandy coves around the Bay, is perhaps the most valuable crustacean of this coast, for besides being used as food, it is the common, and almost the only bait with which fish of all kinds are taken.

Among other localities in which this species has been found, the following may be mentioned: Puget Sound, (Suckley;) Shoalwater Bay, (Cooper;) Tomales Bay, (Samuels;) and Monterey, (Taylor.)

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Paris; Acad. Petrop.

CRANGON NIGRICAUDA. Stimpson.

Plate XXII. f. 6.

Crangon vulgaris, OWEN, (non FABR.) *Zoöl. of Beechey's Voyage*, p. 87. DANA, *U. S. Exploring Expedition, Crust.* i. 536, ii. 561.
Crangon nigricauda, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species resembles very closely the common shrimp of Europe and of the Northern United States. It differs, however, from that species in its broader carapax, its slightly smaller, and comparatively shorter hand, and more pointed caudal segment, which has also a shallow longitudinal furrow along the upper surface. The antepenultimate abdom-

inal segment exhibits a rather sharp ridge along the dorsal edge, which is not perceptible in *C. vulgaris.* These differences are indeed very slight, but they are nevertheless constant, and taken together with the remoteness of the geographical limits of the two forms, they seem to indicate with certainty a specific diversity.

The color of our species is a very dark gray, or blackish, becoming entirely black at the tail. Hands tinted with lilac. The hand (see figure) is very different from that of *C. Franciscorum*, but even without reference to this character, the black tail will enable any one readily to pick out specimens of this species from the heaps of the common kind which may be seen on every fish-stand in the market.

C. nigricauda is much less abundant in San Francisco Bay than the preceding species, and is found in deeper water. It occurs in Puget Sound, (Exploring Expedition;) at the mouth of the Columbia, (Trowbridge;) Tomales Bay, (Samuels;) and at Monterey, (Capt. Beechey.)

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Expl. Exped.; Paris; Acad. Petrop.; R. C. S.; Zoöl. Soc.

CRANGON MUNITUS. Dana.

Crangon munitus, DANA; *U. S. Exploring Expedition, Crust.* i. 536. Pl. XXXIII. f. 5.

Remarkable for the four strong spines with which its carapax is armed on the superior surface.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

PARACRANGON ECHINATUS. Dana.

Paracrangon echinatus, DANA; *U. S. Exploring Expedition, Crust.* i. 538. Pl. XXXIII. f. 6.

With the hands of a *Crangon* this species resembles

Hippolyte in its long elevated rostrum and inflexed abdomen. The carapax is everywhere spinous.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

ATYA SCABRA. Leach.

Atya scabra, LEACH; *Zoöl. Miscel.* v. iii. Pl. CXXXI. MILNE-EDWARDS; *Hist. Nat. des Crust.* ii. 348. Pl. XXIV. f. 15–19. NEWPORT; *An. and Mag. Nat. Hist.* 1847, xix. 159.

Atya Mexicana, WIEGMANN; *Archiv für Naturgeschichte,* 1836, i. 145.

The specimens in the Museum of the Smithsonian Institution from the fresh waters of Western Mexico agree in all their characters with the description given by WIEGMANN of his *A. Mexicana,* while they are exactly represented by the published figures of *A. scabra.* Under these circumstances, I have ventured to cite WIEGMANN'S name as a synonym. MILNE-EDWARDS considers *A. scabra* to be a marine form, but there is great doubt that any species of the genus is found in the sea.

Hab. Misantla, (Deppe;) Western Mexico, (Mus. Smithsonian.)

Mus. Phil. Acad.; Smithsonian; Paris; Berlin; Brit. Mus.

HIPPOLYTE AFFINIS. Owen.

Hippolyte affinis, OWEN; *Zoöl. of Beechey's Voyage,* 90, Pl. XXVII. f. 4.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S.; Zoöl. Soc.

HIPPOLYTE LAMELLICORNIS. Dana.

Hippolyte lamellicornis, DANA; *U. S. Exploring Expedition, Crust.* i. 567. Pl. XXXVI. f. 6.

This species is very closely allied to *H. Ochotensis,* BRANDT, and to *H. affinis,* OWEN. From the latter it appears to differ in wanting teeth on the inferior side of the rostrum.

Hab. Straits of De Fuca, (Expl. Exped.)

Mus. Expl. Exped.

HIPPOLYTE LAYI. Owen.

Hippolyte Layi, OWEN; *Zoöl. of Beechey's Voyage*, 90, Pl. XXVII. f. 3. BRANDT; *Sibirische Reise, Zoöl.* i. 117.

In this and the succeeding species the rostrum is much longer than in any other herein mentioned, often exceeding three fourths that of the thorax. Only two or three of the dorsal teeth belong to the thorax proper, and the posterior one of these is at about the anterior third of its length.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S; Zoöl. Soc.

HIPPOLYTE SITCHENSIS. Brandt.

Hippolyte Sitchensis, BRANDT; *Sibirische Reise, Zoöl.* i. 116, Pl. V. f. 18.

This differs from *H. Layi*, in having a smaller number of larger and more crowded teeth on the rostrum, but it is probably only a variety.

Hab. Sitka, (Brandt;) Monterey, (A. S. Taylor.)

Mus. Acad. Petrop.

HIPPOLYTE PALPATOR. Owen.

Hippolyte palpator, OWEN; *Zoöl. of Beechey's Voyage*, 89. Pl. XXVII. f. 3. BRANDT; *Sibirische Reise, Zoöl.* i. 117. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species may be determined by its rather slender form, small rostrum, and very long outer maxillipeds. The dorsal crest is six-toothed above, the posterior tooth being just in front of the middle of the thorax. The rostrum is very slender, about one fourth as long as the thorax, and tapers to a sharp, sometimes bifid, extremity.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S.; Zoöl. Soc.

HIPPOLYTE BREVIROSTRIS. Dana.

Hippolyte brevirostris, DANA; *U. S. Exploring Expedition, Crust.* i. 566. Pl. XXXVI. f. 5. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

Some individuals of this species approach so closely to *H. palpator*, that I am half inclined to consider it as a variety. Both are characterized by having greatly elongated outer maxillipeds, two subocular teeth on the margin of the carapax, and large thoracic dorsal teeth, the posterior one near the middle of the thorax. *H. brevirostris* is apparently a more robust species; the rostrum is generally shorter, and has fewer teeth; and the shield of the second abdominal segment is much larger than that of *H. palpator* as figured by OWEN. The slender flagellum of the internal antennæ is generally scarcely longer than the stout one. Posterior feet moderately spinulose. Basal joints of outer maxillipeds with serrated margins. Color, uniform light crimson or scarlet.

Hab. Straits of De Fuca, (Expl. Exped.;) San Francisco Bay, (W. S.)

Mus. Expl. Exped.; Phil. Acad.; Smithsonian.

HIPPOLYTE TAYLORI. Stimpson, n. s.

In this species the rostrum is exceedingly short, consisting only of the small terminal tooth of the dorsal crest, and projecting scarcely beyond the anterior margin of the thorax. This dorsal crest is serrated with six teeth, including the terminal one. The posterior tooth is at the middle of the thorax; and the second and third (from the front) are rather above than behind the first, which is much the smallest. There is a single sharp spine beneath the eye, but hardly a vestige of another beneath this. The feet of the first pair are very stout; those of the second pair reach the tips of the maxillipeds. This species is more slender than the

preceding, and is further distinguished by the extreme shortness of the rostrum.

Found at Monterey, by Alexander S. Taylor, Esq., to whom this species is dedicated in recognition of his services in enriching our collections with new forms of Californian animals.

Mus. Smithsonian.

PANDALUS PUBESCENTULUS. Dana.

Pandalus pubescentulus, DANA; *U. S. Exploring Expedition, Crust.* i. 568. Pl. XXXVI. f. 8.

Rostrum seven-toothed below, and, including the dorsal ridge, seventeen-toothed above; teeth small; apex of rostrum bifid. Surface minutely pubescent.

The *Pandali* may be distinguished from the *Hippolytes* by their non-chelate anterior feet.

P. pubescentulus is known only by the excellent figures and description of DANA, drawn from specimens collected in the Straits of De Fuca, by the Exploring Expedition, in the Museum of which they are deposited.

PANDALUS BOREALIS. Kroyer.

Pandalus borealis, KROYER; *Tidsskrift*, 1838, ii. 254. BRANDT; *Sibirische Reise, Zoöl.* i. 122.

This species is common to the boreal waters of both oceans.

Hab. Unalaschka, (Wosnessenski.)
Mus. Acad. Petrop.

PANDALUS PLATYCEROS. Brandt.

Pandalus platyceros, BRANDT; *Sibirische Reise, Zoöl.* i. 123.

Hab. Unalaschka, (Wosnessenski.)
Mus. Acad. Petrop.

PANDALUS HYPSINOTUS. Brandt.

Pandalus hypsinotus, BRANDT; *Sibirische Reise,* i. 125.

Hab. Unalaschka, (Wosnessenski.)

Mus. Acad. Petrop.

The preceding four species appear to resemble each other closely, and may perhaps be reduced to two upon more careful examinations of numerous individuals. Having no specimens of any of them, I have preferred to follow previous authors rather than to attempt identifications from descriptions alone.

PANDALUS DANÆ. Stimpson.

Pl. XXI. f. 6, 7.

Pandalus Danæ, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

Thorax glabrous. Twelve teeth on the superior edge of the rostrum, including the dorsal crest, the posterior one being at about the middle of the carapax. Rostrum smooth above near its trifid apex, and six-toothed below, the basal tooth being large and much curved. Feet spinulose; the spinules on the third joints few and distant. Length two and five tenths inches.

This species differs from all of those above mentioned in the much smaller number of teeth on the dorsal crest. The trifid apex is also quite characteristic.

Dredged opposite Fort Townsend, in Puget Sound, by Capt. Murden, of the cutter "Jefferson Davis." This, with several other species of great interest, were forwarded by Dr. Suckley.

Mus. Smithsonian; Phil. Acad.

PALÆMON BRACHYDACTYLUS. Wiegmann.

Palæmon brachydactylus, WIEGMANN; *Archiv für Naturgeschichte,* 1836, i. 148.

Inhabits the fresh waters of Western Mexico.

Mus. Berlin.

PALÆMON HETEROCHIRUS. Wiegmann.

Palæmon heterochirus, WIEGMANN; *Archiv für Naturgeschichte*, 1836, i. 149.

This is another of the large fresh-water shrimps of Mexico. They frequently attain a length of two feet, including that of the chelopoda, which are at least as long as the body.

Mus. Berlin.

STOMAPODA.

SQUILLA DESAUSSUREI. Stimpson.

Squilla scabricauda, DESAUSSURE, (non LATR.) *Rev. et Mag. de Zoöl.* v. 367.

Hab. Mazatlan, (Verreaux.)
Mus. of M. Verreaux, Paris.

ISOPODA.

IDOTÆA CONSOLIDATA. Stimpson.

Idotæa consolidata, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

Body convex, broadest at the fourth thoracic segment. First four segments of thorax larger in every dimension than the last three, each bearing an umbo near the lateral margin, which is turned up a little. A sharp, slightly elevated transverse ridge across the thorax on each segment near its posterior margin. No distinct epimeral sutures. Abdomen convex, formed of a single piece, with a slight transverse impressed line, indicating the partial separation of an anterior segment; it is narrowed toward the posterior extremity, which is terminated by a slight concavity. Head emarginate at the middle in front; cephalic suture distinct, separating a small segment from the posterior part of the head; eyes strongly convex, laterally projecting; a prominent minute tubercle just in front of each eye. External antennæ half as long as the body; flagellum with ten

oblong joints. Internal antennæ reaching to the fourth joint of the peduncle of the external ones. Feet slender, slightly pilose, with rather long hairs; their terminal joints elongated. Color in one specimen opaque whitish; in another, reddish and brownish, mottled. Length, 0.4; breadth, 0.18 inch. Taken on a sandy bottom in ten fathoms, in the Bay of San Francisco near its entrance.

Mus. N. P. Expl.

IDOTÆA WOSNESSENSKII. Brandt.

Idotæa Wosnessenskii, BRANDT; *Sibirische Reise, Zoöl.* i. 146.
Idotæa hirtipes, DANA; *U. S. Exploring Expedition, Crust.* ii. 704. Pl. XLVI. f. 6.
Idotæa Oregonensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

An exceedingly common species, of a dark green color, found among sea-weeds on rocky or stony shores between high-water and half-tide marks.

Hab. Atcha and Sitka, (Wosnessenski;) Puget Sound, (Suckley,) "Oregon," (Expl. Exped.;) Shoalwater Bay, (Cooper;) Upper California, (Wosnessenski, Le Conte;) San Francisco Bay, (Stimpson.)

Mus. Acad. Petrop.; Paris; Expl. Exped.; Smithsonian; Phil. Acad.; Bost. Soc.

IDOTÆA MEDIA. Dana.

Idotæa media, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 175.

Differs from the preceding species in having a comparatively longer abdomen.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

IDOTÆA RESECATA. Stimpson.

Pl. XXII. f. 7.

Idotæa resecata, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

Body slender, convex along the middle above; thorax flat or even concave below. Greatest breadth at the sixth

thoracic segment. Abdomen subrectangular, broadest anteriorly, nearly twice as long as broad, and equalling in length the four preceding thoracic segments taken together; its sides slightly concave; posterior extremity with a deep concavity, terminating on either side in a sharp angular projection or tooth. First and second segments of the abdomen sufficiently well marked, the third also distinct on the sides:—the three occupying the anterior third of the length of the abdomen. Outer antennæ reaching the fourth thoracic segment; peduncle rather stout; flagellum 17-articulate. Basal article of inner antennæ greatly expanded, suborbicular. The opercular (first) pair of abdominal feet are broad, with the terminal joint square. Inner sides of ambulatory feet with short setæ. Color greenish yellow, with a median line of dark-red. Length, 1.7; breadth, 0.33 inch. Proportion of breadth to length, 1 : 5.15.

This species resembles the Mediterranean *I. hectica* in general appearance, and is not liable to be confounded with any other species found on our western coast.

The only specimen known was dredged in the Straits of DeFuca, opposite Fort Townsend, by Capt. Murden.

Mus. Smithsonian.

STENOSOMA GRACILLIMUM. Dana.

Stenosoma gracillimum, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

Hab. California, (Le Conte.)
Mus. of Prof. Dana.

SPHERILLO AFFINIS. Dana.

Spherillo affinis, DANA. *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 176.

A terrestrial species found in California by Dr. Le Conte.
Mus. of Prof. Dana.

PORCELLIO GEMMULATUS. Dana.

Porcellio gemmulatus, DANA; *U. S. Exploring Expedition, Crust.* ii. 725. Pl. XLVII. f. 7. *Proc. Acad. Nat. Sci. Philad.* vii. 176.
Philoscia tuberculata, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This little wood-louse is somewhat variable in many of its characters. The dorsal granulation is coarser in some specimens than in others, and often shows no tendency to arrangement in rows. The spines of the feet of the second pair are simple in some specimens. A comparison of many individuals convinces me of the identity of my *Philoscia tuberculata* with the species previously described by DANA.

Hab. Oregon, (Expl. Exped.;) "California," (Le Conte;) San Francisco, (Expl. Exped. and N. P. Exped.)

Mus. Expl. Exped.; N. P. Exped.

STYLONISCUS GRACILIS. Dana.

Styloniscus gracilis, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 176.

Hab. California, (Le Conte.)
Mus. of Prof. Dana.

ALLONISCUS PERCONVEXUS. Dana.

Alloniscus perconvexus, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 176.

Hab. California, (Le Conte.)
Mus. of Prof. Dana.

Both the above species, like the two preceding them, are terrestrial.

LYGIA OCCIDENTALIS. Dana.

Lygia occidentalis, DANA; *U. S. Exploring Expedition, Crust.* ii. 742. Pl. XLIX. f. 7.—*Proc. Acad. Nat. Sci. Philad.* vii. 176.

The Lygiæ are isopoda of rather large size, and nearly amphibious habits, generally found running about with

great velocity among the stones or debris of shores after the retreat of the tide. They are never found elsewhere than in close proximity with water, which may be either salt, brackish, or fresh. *L. occidentalis* was originally discovered on the banks of the Sacramento River, by Dr. Pickering of the Exploring Expedition, and has since been found in various parts of California.

LYGIA DILATATA. Stimpson.

Pl. XXII. f. 8.

Lygia dilatata, Stimpson; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

Body variable in its proportions, but usually very broad; the proportion of the breadth to the length being often 1:1.5. Surface granulated. Margins of the articulations raised or thickened, and smooth. Head with a transverse ridge between the eyes, interrupted at the middle. External antennæ not very slender, reaching the sixth thoracic segment; flagellum consisting of fourteen scarcely oblong joints. Caudal appendages, very short, generally not more than one fifth the length of the body, often even shorter; basal joint or peduncle as broad as long, with a sharply produced angle exterior to the insertion of the stylets, the inner one of which is provided with a terminal bristle as in *L. occidentalis*. Color blackish.

Young specimens are much less broad than the adults, as the breadth increases with growth much faster than the length. It is at first difficult to conceive how they can belong to the same species, but a careful examination of specimens of all ages shows this to be the case. The dimensions of two specimens are as follows:—

Adult,	length,....1.42	breadth,....0.96 inch.
Young,	" 0.98	" 0.45 "

Found in considerable numbers in the summer of 1856, at Fort Steilacoom, Puget Sound, by Dr. George Suckley, a gentleman to whose assiduous and successful researches in the field of natural science we are indebted for many

most interesting additions to the fauna of Washington Territory.

Mus. Smithsonian.

LIVONECA VULGARIS. Stimpson.

Pl. XXII. f. 9.

Livoneca vulgaris, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

This is the common fish-louse of the San Francisco market. It is variable in shape, often distorted, and frequently abruptly widened at the fifth thoracic segment. Head small, wider than long; inner antennæ somewhat shorter and stouter than the outer or posterior ones. Epimeral pieces narrow, separated from the tergal piece in the anterior segments by a distinct suture, in the posterior segments by a deep incision; the point reaching the margin of the tergum in the anterior four segments, and not extending much beyond it in the posterior three. Posterior thoracic segment deeply sinuated for the reception of the middle portion of the anterior abdominal segments. Lamelliform caudal segment always transverse in the adult. Color yellowish gray; posterior pair of false feet always black. Length, 1.5; breadth, 0.9 inch. It resembles *L. Desmarestii* in general appearance.

Parasitic on fish of several kinds. Tomales Bay, (Samuels;) San Francisco Bay, (Stimpson;) Monterey, (Trowbridge.)

Mus. Smithsonian; Bost. Soc.

ÆGA MICROPHTHALMA. Dana.

Æga microphthalma, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854. vii. 176.

Hab. "California," (Le Conte;) Monterey, (Taylor.)

Mus. Smithsonian.

The body in this species is generally considerably broader in the young than in the adult. Upper surface covered with

a short pubescence. Head and first three thoracic segments sculptured with impressed lines parallel to the margin. All the thoracic segments except the first are provided with large sculptured epimera; those of the first two pairs smaller in size, with two submarginal impressed lines; those of the posterior five pairs projecting beyond their segments, and marked with a diagonal median line as well as one parallel to the lower margin.

The specimens to which the above description applies approximate somewhat, in the character of the anterior thoracic feet, to the genus *Cirolana*, and, although probably only a variety of *Æga microphthalma*, may perhaps prove distinct, in which case I would propose for them the name *Cirolana pubescens*.

ÆGACYLLA LECONTII. Dana.

Ægacylla LeContii, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 177.

Hab. California, (Le Conte.)
Mus. of Prof. Dana.

SPHÆROMA OREGONENSIS. Dana.

Sphæroma Oregonensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 778. Pl. LII. f. 4. *Proc. Acad. Nat. Sci. Philad.* vii. 177.

This little crustacean is very common on the coasts of California and Oregon, and congregates in large numbers under stones near low-water mark in sheltered situations. It looks very much like an *Oniscus*, or pill-bug, rolling itself into a ball when disturbed. It was found in Puget Sound, (Pickering;) Shoalwater Bay, (Cooper;) and in San Francisco Bay, (Expl. Exped.)

Mus. Smithsonian; Bost. Soc.; Phil. Acad.; Paris; Acad. Petrop.

SPHÆROMA AMPLICAUDA. Stimpson.

Pl. XXIII. f. 1.

Sphæroma amplicauda, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 89.

Body gradually widening from the head backwards. Thorax transversely ridged, the ridges corresponding in number to the segments; and provided with three (sometimes five) longitudinal rows of small tubercles, those of the middle row becoming gradually larger posteriorly, the terminal one subspiniform, pointing backward. Epimeral pieces, distinct and well separated, especially those of the posterior segments, and thickened so as to give a raised margin to the thorax. Abdomen large, forming two fifths of the length of the body, triangular, terminating in an acute point; segments all coalescent with the exception of the first, next the abdomen, which is distinctly separate, and bears a tubercle on either side in the line of those of the thorax. There are sometimes also two slight, approximated tuberculous ridges, along the middle of the anterior half of the caudal plate. Lamellæ of posterior pair of false feet very large, much expanded, but not extending posteriorly beyond the extremity of the abdominal plate; the exterior margin of the outer lamella is anteriorly much reflexed. The antennæ in this species are rather long.

Dimensions,—Length,	0.25 inch
Breadth at seventh thoracic segment,	0.119 "
" of caudal extremity including appendages,	0.17 "

The epimera in this species are much more distinct than is usual in the genus. A few specimens were found adhering to some fragments of star-fishes picked up on the beach of Tomales Bay, by Mr. Samuels.

Mus. Smithsonian.

ANISOPODA.

ARGEIA PUGETTENSIS. Dana.

Argeia Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 804. Pl. LIII. f. 7.

Found under the thoracic shield of *Crangon munitus.*
Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

ARGEIA PAUPERATA. Stimpson, n. s.

This species is somewhat larger than the preceding; the head is comparatively smaller, more tumid, and bilobate; the egg-pouch covers the eggs more completely; and the thoracic branchial appendages are apparently absent in some of the anterior segments. The inner branches of the first three pairs of abdominal appendages are broader; those of the last three pairs are wanting. Length, 0.35; breadth, 0.23 inch. This description is taken from a female.

Found in specimens of *Crangon Franciscorum*, from San Francisco Bay.

PHYLLODURUS. Nov. gen.

Feminæ pedes thoracis sat validi, toti ancorales, unguiculati; appendicibus branchialibus carentes. Appendices abdominis branchiales; superiores laterales, laminis duabus æquis magnis elongatis; inferiores papilliformes. Abdominis segmentus primus setis dorsalibus unguiculatis instructus.

PHYLLODURUS ABDOMINALIS. Stimpson, n. s.

This curious form of parasitic anisopods was found attached to, and lying between the abdominal feet of the common *Gebia*, adhering by the sharp hook-shaped terminal

joints of its feet, and perhaps aided in keeping its position by the sharp dorsal setæ of the abdomen. As might be expected from this external parasitism, the shape of the body is symmetrical, being never distorted, as is almost always the case in those forms which live in the usual position—in the confined space under the thoracic shield of the shrimp or cray-fish.

In our species the thorax is somewhat cordate in shape, broadest behind, the short abdomen being set in the concavity. The thoracic segments are well separated and provided with distinct tumid epimera; the external envelope is soft, being even less hard and crustaceous than in *Argeia.* The head is somewhat broader than long, strongly tumid, and in the character of its appendages resembles somewhat that of *Ione.* The front projects abruptly, forming a horizontal margin to the head, beneath the anterior part of which the small inner antennæ are concealed. The outer antennæ arise laterally, and behind the inner ones, which they much exceed in length, being as long as half the width of the head. There are no thoracic branchial appendages. The thoracic feet are similar in character throughout; they gradually increase in length posteriorly, and are each provided with a small hand, the hooked finger of which is of moderate length, more than reaching the projecting inferior angle of the antepenultimate article.

The abdomen is triangular, and consists of six deeply separated segments, the terminal one being very minute. The basal segment is much the largest, and bears upon its dorsal surface two papillæ, one on each side, which are provided with short, stiff, somewhat hooked setæ. The lateral extremities of the abdominal segments are split by a marginal furrow into superior and inferior rami; the latter being simply conical with two or three circular wrinkles; and the former (superior) each surmounted by a cylindrical pedicle which bears two large cultriform lamellæ. There are thus twelve pairs of these lamellæ, which are of large size, and

being crowded, project in different directions, nearly concealing the posterior half of the animal. Each is about one fifth as broad as long, compressed on the inner and thickened along the outer or convex edge.

Only females of this species have as yet been found. The dimensions of one specimen are,

Length of body, ...	0.58 inch.
" " abdomen, ...	0.12 "
" " superiorabdominal appendages, .	0.24 "
Breadth of thorax, ...	0.45 "

Several examples of this singular crustacean have been found on *Gebiæ* from Puget Sound and Tomales Bay.

AMPHIPODA.

CAPRELLA CALIFORNICA. Stimpson.

Caprella Californica, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

The body in this species is slender. The antennæ are exceedingly variable in their proportions; the flagella of the superior ones 10–15 articulate; inferior ones subpediform. A more or less developed spine, which curves forward, and is sometimes of considerable length, is placed upon the dorsal surface at the anterior extremity of the first thoracic segment. Hand of the second pair of feet generally three-toothed on the inner surface; teeth (in full grown specimens) about equal in size, and placed mostly toward the outer extremity of the palm. Two or three sharp tubercles along each of the sides of the branchiferous segments; and a short dorsal spine on each of the three posterior segments. Hands of posterior feet slender. Color, variable. Length, one inch; breadth, about 0.03 inch.

Found on seaweeds, etc., below low-water mark in San Francisco Bay, near its entrance.

Mus. of the North Pacific Expedition.

COROPHIUM SPINICORNE. Stimpson.

Corophium spinicorne, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species is rather thick and robust in shape. The inferior antennæ are half as long as the body, without flagella, and with a large, curved, sharp-pointed spine at the inferior extremity of the very thick antepenultimate article. There is also a stout spine beneath on the basal article, and a small one at the inner base of the penult. Superior antennæ slender, and but little shorter than the inferior ones. Feet well brushed with plumose hairs; those of the first pair with minute subcheliform hands, with the palm transverse; third and fourth articles with long setæ along the inferior edge. Feet of the second pair simple, but with the third and fourth joints conjoined laterally, as if forming a hand, not however subcheliform; the fourth article is placed inferiorly and fringed with long hairs. Caudal stylets placed rather underneath than on the sides of the abdomen, but otherwise much as in *C. longicorne*, except that the external ramus in the second pair is scarcely cultriform. Color brownish, darkest at the head, with transverse bands of light yellow corresponding to the segments; antennæ brownish. Length, 0.4 inch; breadth at the fifth thoracic segment, 0.08 inch.

It is common among confervæ, etc., in the little creeks of the salt marshes on the shores of San Francisco Bay.

Mus. N. P. Exp.

COROPHIUM SALMONIS, Stimpson, n. s.

In examining anatomically a species of salmon from Puget Sound, in the museum of the Smithsonian Institu-

tion, the stomach was found to be filled with Amphipoda, chiefly a species of *Corophium*. The specimens were not in a very good state of preservation, but enough remained to show that although agreeing with the preceding species in most characters, particularly in the spines of the antennæ and the hairiness of the feet, they are yet specifically distinct. . The body is rather more elongated and depressed than in *C. spinicorne;* the inferior antennæ are much longer, and the superior ones smaller. The color is a reddish purple.

Mus. Smithsonian.

ERICHTHONIUS RAPAX. Stimpson, n. s.

If the obsolescence of the first two pairs of epimera in Edwards' *Erichthonius*, shall prove a constant and not an accidental character, the species here described will properly be referred to *Pyctilus*, Dana. There are small epimera on the first thoracic segment, and larger ones on the second; both narrow, not touching each other. Antennæ sub-equal, one third as long as the body; superior ones with six-articulate flagella; inferior ones strongly toothed at the inferior angle of their basal joint, and with ten-articulate flagella. Mandibular palpi reaching beyond the middle of the basal joint of the superior antennæ. Eyes on lobes which protrude forward between the bases of the antennæ. Hands of the first pair small, sub-cheliform; those of the second pair of great size, with a bi-articulate finger, and a thumb one third as long as the finger, with a strong tooth at the middle of its inner side. Color, brownish. Length, one fourth of an inch.

It was dredged on a sandy bottom at the depth of two fathoms, in the Bay of San Francisco, near the city.

Mus. N. P. Exp.

MEGALORCHESTIA SCABRIPES. Stimpson.

Orchestia scabripes, DANA; *U. S. Exploring Expedition, Crust.* ii. 860, Pl. LVII. f. 4.

Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

MEGALORCHESTIA CALIFORNIANA. Brandt.

Megalorchestia Californiana, BRANDT; *Bulletin physico-mathém. de l'Acad. de St. Pétersb.* ix. 311. Pl. I. f. 1–6.

This differs from *M. scabripes* among other characters in the great length of the fifth epimeral, and in having the outer branch of the first pair of caudal stylets equally spinulose with the inner one. The feet are not scabrous, while the antennæ are so on a considerable portion of their surface.

Hab. Bodega, (Wosnessenski,) Monterey; (Taylor.)
Mus. Acad. Petrop.; Philad.; Smithsonian.

ORCHESTIA CALIFORNIENSIS. Dana.

Orchestia Californiensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 177.

Hab. California, (Le Conte;) Puget Sound, (Suckley.)
Mus. of Prof. Dana; Smithsonian.

ORCHESTIA PUGETTENSIS. Dana.

Orchestia Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 859. Pl. LVII. f. 3.

Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.; Smithsonian.

ORCHESTIA PICKERINGII. Dana.

Orchestia Pickeringii, DANA; *U. S. Exploring Expedition, Crust.* ii. 882, Pl. LIX. f. 9. *Proc. Acad. Nat. Sci. Philad.* VII. 177.

California, (Le Conte.)
Mus. Expl. Exped.

ORCHESTIA TRASKIANA. Stimpson.

Orchestia Traskiana, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Male, with the inferior antennæ about one third as long as the body; the flagella forming more than half their length, and consisting of fourteen oblong joints; superior antennæ reaching to the extremity of the second joint of the inferior ones. Feet of the first pair with a small hand with a produced lobe at the inferior angle, and a minute finger, as in *O. littorea, pollicifera*, etc.; fourth joint and that preceding it, each with a small tooth below. Feet of the second pair with an ovate hand, with no teeth on the oblique, convex, spinous palm, which terminates posteriorly in a slight notch; finger about half as long as the hand, smooth and much curved. In the *female* the first pair of hands resemble those of the male, except in being smaller, having less produced lobes, and a comparatively longer finger; those of the second pair with a small elongated hand, with a rounded extremity and a rudimentary finger applied at about the middle of the lower edge. In *both*, the feet of the sixth and seventh pairs are about equal in length. Eyes rounded, black. Color, light gray, sometimes greenish or brownish, always very pale. Length, three fifths of an inch.

This species has much resemblance to *O. Pickeringii* and *O. Pugettensis*, but is clearly distinct from both in the following characters. From the former, it differs in the greater length and obliquity of the palm in the hand of the

second pair, which is also destitute of tooth-like lobes; in the tooth on the inferior margin of the third article in the first pair of feet; and in its shorter and stouter antennæ. From the latter, it differs in having oblong instead of transverse joints in the flagella of the inferior antennæ; the flagella being also longer than their peduncles, which are not scabrous; there is also no two-jointed process on the third joint in the second pair of feet.

O. Traskiana is exceedingly abundant in the vicinity of San Francisco, living among the rejectamenta along high-water mark. Were it not that I have had opportunity of comparing it with the original specimens kindly lent me by Prof. Dana, I should scarcely have believed that it was not identical with one of the numerous species already described from this coast.

ALLORCHESTES PUGETTENSIS. Dana.

Allorchestes Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 901. Pl. LXI. f. 6.

Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

ALLORCHESTES SEMINUDA. Stimpson.

Allorchestes seminuda, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Body somewhat compressed; eye oval; superior antennæ three fifths as long as the inferior ones, with flagella consisting of thirteen sub-oblong joints; inferior antennæ two-fifths as long as the body, with 14-articulate flagella. On both pairs of antennæ there are a few short setæ at the extremity of each joint. Hand in the first pair of feet small, palm oblique, almost transverse; finger of moderate size; carpus produced at its inferior angle into a sharp projection. Hand in the second pair rather large, oblong-

ovate, deeply excavated below for the reception of the point of the finger, which is more than half as long as the hand. Color pale green; antennæ red. Length, half an inch.

This species is closely allied to *A. Pugettensis*, but is smaller, and more compressed; the superior antennæ are more setose, and the hand of the first pair is different in shape, the palm being much less oblique.

It is common at San Francisco, living among barnacles and seaweed on stones and the piles of wharves, in the littoral zone.

Mus. N. P. Exp.

ALLORCHESTES PLUMULOSUS. Stimpson. n. s.

In this species, the inferior antennæ are about one third as long as the body, and thickly tufted with plumose hairs along the inferior edge; the terminal joint of the peduncle, and all the joints of the 11-articulate flagellum except those near the extremity, being provided below with plume-like bundles of branching setæ, as well as the usual simple ones above and on the sides. The superior antennæ have only a few, simple setæ, which are, however, of considerable length. The hand of the second pair is oblong, two-thirds as broad as long, and rather quadrangular than ovate, with the palm curved, less excavated, and with a much less prominent projection at the extremity of the finger than in the preceding species; the finger is scarcely half as long as the hand. In other characters this species has considerable resemblance to *A. seminuda*. Length, two fifths of an inch. Color, greenish.

It is common on gravelly shores in the littoral zone near the mouth of San Francisco Bay.

Mus. N. P. Exped.

ALLORCHESTES ANGUSTUS. Dana.

Allorchestes angustus, DANA ; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 177.

This species may be recognized by its high epimerals.
Hab. California, (Le Conte.)
Mus. of Prof. Dana.

GAMMARUS PUGETTENSIS. Dana.

Gammarus Pugettensis, DANA ; *U. S. Exploring Expedition, Crust.* ii. 957. Pl. LXVI. f. 1.

Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

GAMMARUS SITCHENSIS. Brandt.

Gammarus Sitchensis, BRANDT ; *Sibirische Reise, Zoöl.* i. 137. Pl. VI. f. 28.

Hab. Sitka, (Wosnessenski.)
Mus. Acad. Petrop.

GAMMARUS ATCHENSIS. Brandt.

Gammarus Atchensis, BRANDT ; *Sibirische Reise, Zoöl.* i. 138. Pl. VI. f. 29.

Hab. Atcha and Unalaschka, (Wosnessenski.)
Mus. Acad. Petrop.

GAMMARUS CONFERVICOLUS. Stimpson.

Mæra confervicola, STIMPSON ; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Body somewhat compressed, smooth except at the posterior three abdominal segments, the dorsal surfaces of which are angular and spinulose or setose. Antennæ of both pairs slender, about equal in their length, which is half that of the body. Superior ones with thread-like 22-articulate flagella constituting two-thirds of their length;

appendiculus 4–5 articulated. In the inferior antennæ the flagellum, of 11 oblong articles, is scarcely shorter than the peduncle, the terminal and penult joints of which are of equal length, and each four or five times as long as the antepenult. The four hands are rather small, of nearly the same size and shape, suboblong; palm transverse, minutely denticulated and setose, finger short, considerably curved. Posterior caudal stylets with unequal rami; the outer ones large, nearly as long as the three posterior segments of the abdomen; inner ones very small and inconspicuous. Color, dark brownish, rarely blackish. Length, 0.5 inch.

This species differs from *G. Atchensis* in the smoothness of the dorsal surface of the first three abdominal segments.

Is found among confervæ in salt marshes near San Francisco; and a few specimens were obtained from the stomachs of salmon caught in Puget Sound.

Mus. N. P. Exped.; Smithsonian.

IPHIMEDIA PUGETTENSIS. Dana.

Iphimedia Pugettensis, Dana; *U. S. Exploring Expedition, Crust.* ii. 932, Pl. LXIII. f. 6.

Hab. Puget Sound, (Expl. Exped.)
Mus. Expl. Exped.

PHOXUS GRANDIS. Stimpson, n. s.

This species is of a much larger size than is usual in the genus. Body broad and robust. Rostrum lamelliform, expanded over the bases of the superior antennæ, with a broadly rounded extremity. Superior antennæ bi-flagellate, the inner flagella very little smaller than the outer ones; both 12-articulate; penultimate article of peduncle entirely concealed beneath the rostrum. Inferior antennæ a little longer than the superior ones; terminal article of peduncle broad at its extremity where its outer angle is

produced and rounded; its inner angle bearing the 15-articulate flagellum. Eye transversely oblong. Feet covered with simple hairs. Those of the first and second pairs with small subcheliform hands; those of the third and fourth pairs with the third and fourth articles dilated, the fifth slender, the sixth very small. Feet of the posterior three pairs very much widened; those of the sixth pair largest. Caudal stylets of the first and second pairs with short styliform rami, the inner ones being a little shorter than the outer ones; those of the third pair with long, flattened, equal rami, the outer ones spinulose along their outer edges, both fringed with long setæ on the inner sides. Terminal caudal spines of considerable length.

The color is yellowish-white. Length, half an inch.

It was dredged on a sandy bottom in ten fathoms, in the channel near the entrance of San Francisco Bay.

Mus. N. P. Exp.

PÆCILOPODA.

ARGULUS PUGETTENSIS. Dana.

Argulus Pugettensis, DANA; *U. S. Exploring Expedition*, *Crust.* ii. 151, Pl. XCIV. f. 2.

Several specimens of this species were taken from fishes in Tomales Bay, by Mr. Samuels.

Mus. Expl. Exped.; Smithsonian.

ECHINODERMATA.

The Echinoderms, as yet known from this coast, are few in number. In fact, the character of the greater part of the shores of California and Oregon is not such as affords the most favorable conditions for the development of numerous species of this order. Nearly the whole line of coast is

open, and presents a succession of inaccessible, perpendicular, rocky cliffs alternating with barren beaches of sand, all being completely exposed to the action of the breakers, which roll in upon them with the concentrated force of the storms of a wide and unbroken ocean. There is a want of variety in station, and a paucity of inlets, bays and islands, in the protected nooks of which such animals as we are now to consider usually find shelter. Extensive dredging operations would no doubt bring to light many species in places where the nature of the bottom is favorable, but the submarine zone in which the depth of water is not too great for the existence of animal life, is narrow; since, as we might judge from the mountainous character of the shores, the sea-bottom dips far beyond the reach of the ordinary sounding-line, in close proximity with the land.

There are but two important inlets on the coast, and of these Puget Sound is without doubt the best locality for researches among the marine invertebrata. The Bay of San Francisco, from the admixture with its waters of the turbid flood of two large rivers, and the smallness of the gate which admits to it the clear water of the ocean, is nearly barren of animal life except at its entrance. At a former epoch, and one geologically speaking quite recent, the sea had a much freer sweep through the bay. On its shores I have often observed extensive superficial deposits of shells, of the same species that now live on the coast, (*Mytili*, *Ostreæ*, etc.) lying in a horizontal stratum at a slight elevation above the present high-water mark. These are particularly abundant beneath the soil in the valleys of Petaluma and Sonoma, extending thence toward the sea at Bodega; and here perhaps an ancient gate existed. Another opening may have been situated at the southern extremity, through what is now the Valley of Santa Clara.

A preponderance of *Asteriadæ* will be noticed among the Echinodermata now to be described. The restricted genus *Asterias* (*Asteracanthion*, Müll. et Trosch.) is par-

ticularly well represented on the Northwest Coast. Of the *Ophiuridæ* but two species are here known to exist, neither of which can be now specifically indicated, as the specimens are not at hand. One is a small *Ophiolepis*, dredged by me near San Francisco, and the other an *Astrophyton* taken in Puget Sound by the captain of a coasting vessel, in whose hands it was seen and reported to me by Dr. Cooper.

HOLOTHURIADÆ.

HOLOTHURIA CALIFORNICA. Stimpson, n. s.

Body much elongated, of nearly the same thickness throughout; below, flattened and thickly covered with stout sucker-bearing feet not arranged in rows. Dorsal surface with about forty large conical cutaneous processes (or false feet) sparingly scattered; between which there are numerous small cirriform feet, also diskless. Tentacula twenty, short, peltate, with broad disks. Color, reddish-brown above; below, lighter. Length, 1½ ft.; thickness, 1¼ inches.

Taken in Tomales Bay by Mr. Samuels.

HOLOTHURIA SITCHÆNSIS. Brandt.

Diploperideris Sitchænsis, BRANDT; *Prod. desc. anim. Mertens.*, 52.

Hab. Sitka, (Mertens.)

ASPIDOCHIR MERTENSII. Brandt.

Aspidochir Mertensii, BRANDT; *Prod. desc. anim. Mertens.*, 46.

Hab. Sitka, (Mertens.)

PENTACTA FRONDOSA. Jæg.

Pentacta frondosa, JÆG. AYRES; *Proc. Cal. Acad. Nat. Sci.* i. 68.

The small *Pentactæ*, found in the vicinity of San Francisco, are referred by Dr. Ayres to this species.

PENTACTA MINIATA. Brandt.

Cladodactyla miniata, BRANDT; *Prod. desc. anim. Mertens.*, 44.

Hab. Sitka, (Mertens.)

PENTACTA NIGRICANS. Brandt.

Cladodactyla nigricans, BRANDT; *l. c.* 44.

Hab. Sitka, (Mertens.)

PENTACTA ALBIDA. Brandt.

Cladodactyla albida, BRANDT; *l. c.* 44.

Hab. Sitka, (Mertens.)

CUVIERIA SITCHÆNSIS. Brandt.

Cuvieria Sitchænsis, BRANDT; *l. c.* 47.

Hab. Sitka, (Mertens.)

LIOSOMA SITCHÆNSE. Brandt.

Liosoma Sitchænse, BRANDT; *l. c.* 58.

Hab. Sitka, (Mertens.)

LIOSOMA ARENICOLA. Stimpson, n. s.

Body thick fusiform; skin coriaceous; surface smooth and glabrous, without suckers or processes of any kind. Tentacles fifteen in number, very small, contracting into a circular groove at the margin of the mouth, where they are each concealed in a small cavity formed by folds of the skin. Each tentacle is composed of a short peduncle with four or five digitations at the disk-like summit; these branches being also minutely pinnate toward their extremities. Oral ring composed of five slender calcareous pieces,

projecting and bifurcate below, notched above. Respiratory trees very slender; genital tubes two or three times divided. Color, yellowish-white, clouded with reddish above. Length of an alcoholic specimen four inches; thickness, two inches.

Found at San Pedro, Cal., by Lieut. Trowbridge.

The genus differs from *Chirodota* in the want of the calcareous deposits of the skin so characteristic of the latter form.

CHIRODOTA DISCOLOR. Esch.

Chirodota discolor, ESCHSCHOLTZ; *Zoölogischer Atlas,* Pl. X. f. 2.

Hab. Sitka.

CHIRODOTA VERRUCOSA. Esch.

Chirodota verrucosa, ESCHSCHOLTZ; *Zoölogischer Atlas, Pl.* X. f. 3.

Hab. Sitka.

ECHINIDÆ.

ECHINUS CHLOROCENTROTUS.

Echinus chlorocentrotus, BRANDT; *l. c.* 64.

This may be distinguished by its very short spines.

Hab. Sitka, (Mertens.) Dr. Cooper informs me that a green *Echinus* is common on the shores of Puget Sound, which is probably this species.

ECHINUS PURPURATUS. Stimpson, n. s.

Form depressed. Outline somewhat pentangular. Ambulacral areas of the same width as the interambulacrals; (sometimes even wider;) with eight pairs of pores in each of the very oblique rows, which are separated from each other by rows of small tubercles. Interambulacral area with

six rows of larger tubercles, between which smaller ones are interspersed; the tubercles of the two rows next within the exterior ones are largest. Auricles slender. Spines of moderate length, rather stout and blunt. Color, deep purple. Diameter, $2\frac{1}{2}$ inches; height, $1\frac{1}{3}$ inch.

Found at low-water mark on rocky ocean shores near San Francisco. It is often sold in the market, being used as food by some classes of the citizens, chiefly those from Southern Europe.

DENDRASTER EXCENTRICUS. Esch.

Scutella excentrica, ESCHSCHOLTZ; *Zoölogischer Atlas*, Pl. XX. f. 2.
Echinarachnius excentricus, VALENCIENNES; *Voy. Venus, Zoöph.* Pl. X.
Dendraster excentricus, AGASSIZ; *Cat. des Echinides*, 77.

This is the common cake-urchin of the coast, and is found at all points from Sitka to Monterey.

ASTERIADÆ.

ASTERIAS OCHRACEA. Brandt.

Pl. XXIII. f. 2.

Asterias ochracea, BRANDT; *Prod. desc. anim. Mertens*, 69.

Rays five, each scarcely twice as long as the disk is wide. Larger dorsal spines capitate, somewhat reticulating, and forming a pentagon at the middle of the disk which encloses the madreporic body. Diameter, eight inches.

It is very common near San Francisco, on rocks at low-water mark, and was also taken at Tomales Bay by Mr. Samuels. It was originally found at Sitka. *A. ianthina*, BRANDT, is probably only a variety.

The figure represents a small portion of the upper surface of one of the rays, to show the arrangement of the spines.

ASTERIAS EPICHLORA. Brandt.

Asterias epichlora, BRANDT; *l. c.* 70.
Asterias Katherinæ, GRAY; *An. & Mag. Nat. Hist.* vi. 179.

This slender-rayed species sometimes reaches a diameter of more than a foot. The specimens in the Smithsonian collection were sent from Puget Sound by Dr. Suckley.

ASTERIAS BREVISPINA. Stimpson, n. s.

Pl. XXIII. f. 3.

Rays five, each equalling in length twice the diameter of the disk. Upper surface covered with very short, blunt, nearly uniform spines, moderately numerous, sometimes forming an irregular row along the middle of the ray, and showing a tendency to reticulation on the sides. Beneath there is a single row of slender ambulacral spines, which are blunt and somewhat irregular in length; between these and the marginal channel there are four rows of short compressed spines, gouge-shaped, or notched by an oblique concavity at their truncated extremities. Madreporic body large. Color yellowish. Diameter, six inches.

Taken from a sandy bottom in ten fathoms near the mouth of San Francisco Bay. The figure represents a portion of the lower surface.

ASTERIAS GIGANTEA. Stimpson, n. s.

Pl. XXIII. f. 4. 5. 6.

Body very large, swollen; rays six in number, in length somewhat less than twice the diameter of the disk. Upper surface covered with numerous short, blunt, equidistant spines, uniform in size and regularly distributed; these spines are somewhat conical in shape, but truncated at the tip and constricted at the base, with the sides longitudinally furrowed. The spines of the lower surface are

short and thick, but slightly compressed and notched at the extremity. Diameter, two feet.

Taken in Tomales Bay, by Mr. Samuels.

ASTERIAS HELIANTHOIDES. Brandt.

Asterias helianthoides, BRANDT; *l. c.* 71.

Hab. Sitka, (Mertens;) Puget Sound, (Suckley;) Tomales Bay, (Samuels.)

ASTERIAS HELIANTHUS. Lamk.

Asterias helianthus, LAMK; GRAY; *An. & Mag. Nat. Hist.* vi. 179.

Hab. Mazatlan, (Moores.)

SOLASTER DECEMRADIATA. Brandt.

Asterias endeca, *var.* decemradiata, BRANDT; *l. c.* 71.

Hab. Sitka, (Mertens.)

LINCKIA LEVIUSCULA, Stimpson, n. s.

Disk very small; rays elongated, cylindrical, in length 2½ times the diameter of the disk. Upper surface covered with slightly protuberant, uniform, spinulose paxilli, which are somewhat irregularly crowded together, leaving deep but very narrow chinks leading to the holes in the network of the skin. The spinules of the paxilli are so crowded that the surface of each appears nearly smooth. Below, the paxilli are still more crowded, but are here quadrate in shape and arranged in three or four rows on each side of the ambulacral furrow; those of the ambulacral row having their spinules less crowded and somewhat longer, forming the marginal series. Diameter, two inches.

Found in Puget Sound, by Dr. Suckley.

ASTERISCUS MINIATUS. Brandt.

Asterias miniata, BRANDT; *l. c.* 68.

This pentagonal star-fish may be readily distinguished by its thin disk and sharp edge.

Hab. Sitka, (Mertens;) Tomales Bay, (Samuels;) San Francisco, (Ayres;) Island of San Miguel, (Trowbridge.)

MEDIASTER ÆQUALIS. Stimpson. Nov. gen. et sp.

Pl. XXIII. f. 7, 8, 9, 10, 11.

This name is proposed for a Goniastroid star-fish, common on the coast of Oregon and California, which I cannot refer to any described genus or species, although it is not impossible that it may belong to one of the numerous genera of J. E. Gray, which are however so imperfectly characterized that it is extremely difficult, if not impossible, to identify them.

Body of little thickness, flat above and below; five-rayed; length of rays equalling or exceeding the diameter of the disk. Skin set with numerous small rounded plates, nearly uniform in size but becoming somewhat smaller toward the margin; they are rather more crowded below than above. Scattered pores on the surface of the skin between the plates. Margins with a double row of large quadrangular plates; those in the upper and lower series opposite. All of the plates above and below, including the marginal ones, are covered with granules nearly uniform in size and easily rubbed off. On the lower surface the granules are somewhat larger and angular, and those on the plates bordering the ambulacral furrows are elongated so as to form subprismatic spines, eight or ten to each plate, the inner ones largest. Anus central, surrounded by a circle of spine-like granules. No pedicellariæ or "two-lipped pores," excepting a single one in the centre

of each plate of the lower marginal series. Color in life, bright red above, pale orange below. Diameter, four inches.

Found in Puget Sound by Dr. Suckley, and by myself near San Francisco.

EXPLANATION OF THE PLATES.

PLATE XVIII.

Cancer antennarius, ♂ of the natural size.

PLATE XIX.

Fig. 1. Side view of carapax of *Loxorhynchus grandis*, ♀ ½ nat.
" 2. *Porcellana rupicola*, ♂ nat. size.
" 3. *Randallia ornata*, ♀ " "

PLATE XX.

Fig. 1. *Cryptolithodes typicus*, ♀ nat. size.
" 2. The same from below.
" 3. " view from behind.
" 4. " side view.
" 5. Inferior surface of the head magnified.
" 6. Portion of flagellum of external antennæ, showing the clavate setæ.

PLATE XXI.

The figures of this plate are all of the natural size.
Fig. 1. *Clibanarius turgidus*.
" 2. Hand of *Gebia Pugettensis*, with the setæ removed.

Fig. 3. Hand of *Callianassa gigas.*
" 4. " *C. Californiensis.*
" 5. " *C. longimana.*
" 6. *Pandalus Danæ.*
" 7. Rostrum of *Pandalus Danæ.*

PLATE XXII.

The figures on this plate are all of the natural size.

Fig. 1. Orbit, antennæ, and rostrum of *Loxorhynchus grandis*, ♀ seen from beneath.

Fig. 2. Orbit, external antennæ, and rostrum of *Loxorhynchus crispatus*, ♂ seen from above.

Fig. 3. Side view of orbit, etc., of *L. crispatus.*
" 4. Outer maxilliped of *L. crispatus.*
" 5. Hand of *Crangon Franciscorum.*
" 6. " *C. nigricauda.*
" 7. *Idotæa resecata.*
" 8. *Lygia dilatata.*
" 9. *Livoneca vulgaris.*

PLATE XXIII.

Fig. 1. *Sphœroma amplicauda*, magnified six diameters.
" 2. Portion of the upper surface of a ray of *Asterias ochracea*, natural size.
" 3. Portion of lower surface of a ray of *Asterias brevispina*, nat.
" 4. Portion of upper surface of *Asterias gigantea*, nat.
" 5 and 6. Views of spines of *A. gigantea.*
" 7. Part of upper surface of *Mediaster æqualis*, natural size, with the granules removed from one half to show the plates.
" 8. Lower surface of the same.
" 9. Part of ambulacral furrow and spines of the same, magnified.
" 10. A paxillus of upper surface of the same, magnified.
" 11. One from the lower surface.

Art. XXVIII.—*A List of the* Fishes *collected in California, by* Mr. E. Samuels, *with Descriptions of the new Species.* *By* Charles Girard, M. D.

I. COTTIDÆ.

1. COTTOPSIS PARVUS, Girard, in Proc. Acad. Nat. Sci. Philad. VII. 1854, 144.

Locality. Petaluma, Sonoma Co.

2. OLIGOCOTTUS MACULOSUS, Girard, in Proc. Acad. Nat. Sci. Philad. VIII. 1856, 133.

Pl. XXIV, fig. 7.

Description. The head is but very slightly broader than deep; its upper surface is depressed and smooth, the interocular space grooved, the snout very declivous and consequently short, narrow, and rounded upon its periphery. The upper jaw protrudes slightly beyond the lower one; the mouth is small, being but moderately cleft; the posterior extremity of the maxillary extending to a vertical line intersecting the pupil. The eye is subcircular, and its diameter contained four times in the length of the side of the head, exactly once in advance of its anterior rim. The head itself forms a little less than the fourth of the entire length. A rather stout bicuspid process arises from the convexity of the preopercle with its acute spines directed obliquely upwards, no other spines being apparent upon the opercular apparatus. In speaking of the upper surface of the head, we omitted mentioning two prominent and acute nasal spines; the nostrils being as usual placed one behind and the other beneath each spine. The branchial apertures are continuous under the throat and the branchiostegal rays six in number.

The body is very much compressed, subfusiform, and deeper than broad even anteriorly. The first dorsal is lower

than the second and contiguous to the latter upon its base; its anterior margin is situated in advance of the base of the pectorals. The caudal fin is slender and proportionally well developed; it constitutes a little less than the fifth of the entire length. The origin of the anal fin is situated a little in advance of the anterior ray of the second dorsal; the interradial membrane is deeply emarginated. The extremities of the posterior rays do not extend so far back as those of the opposite dorsal. The ventrals are slender, inserted posteriorly to the base of the pectorals, their tip reaching and slightly overlapping the vent, which is situated near the anterior margin of the anal fin and provided upon its posterior edge with a double cutaneous flap. The pectorals are well developed; their base is unusually oblique and extends nearly to the inferior surface of the thorax, while their extremities project beyond the origin of both anal and the second dorsal.

Br. VI: VI.; D VIII, 17; A 13; C 3, i, 5, 4, i, 2; VT 3; P 13.

The skin is perfectly smooth and the lateral line well marked, running from the upper part of the thoracic arch to the base of the caudal, making a downward inflection or curve upon the middle of the flanks.

The ground color of the upper region of the head and body is yellowish brown, mottled or variegated with blackish; along the dorsal region a series of blotches of a deeper hue may be observed from the occiput to the base of the caudal; the lower half of the sides is vermiculated rather than mottled in the male, and the abdomen of a bright saffron or yellow hue. The inferior surface of the head presents traces of black markings; the throat and abdomen are unicolor as also the ventrals and anal. The dorsals, caudal, and pectorals are transversely barred upon a yellowish ground.

Specimens were collected in Tomales Bay, Cal. Plate XXIV. fig. 7, represents the species just described, size of life.

3. LEPTOCOTTUS ARMATUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 131, 145; VIII. 1856, 133.
Acanthocottus inermis, AYRES. Ms.

Locality. Tomales Bay.

4. SCORPAENICHTHYS MARMORATUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 131, 145; VIII. 1856, 133.
Hemitripterus marmoratus, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1854, 4.

Locality. Tomales Bay.

5. ASPICOTTUS BISON, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 130; VIII. 1856, 133.
Clypeocottus robustus, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1854, 11.

Locality. Tomales Bay.

6. ARTEDIUS NOTOSPILOTUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 134.

Plate XXIV, figs. 5 and 6.

Description. About three inches and a quarter in total length, the head constituting the third of it, the caudal fin excluded. The occipital region is depressed, and the interocular region, which is broader than in *Artedius lateralis*, instead of being convex is groove-like. The rostral distance gently slopes towards the extremity of the snout, exhibiting two stout and conspicuous nasal spines, behind which is a depression for a tubular posterior nostril; the anterior nostril being as usual on the side of the snout nearer the orbit than the extremity of the rostrum. The posterior extremity of the maxillary extending to a vertical line, passing rather posterior to the middle of the pupil. The eye is large, subcircular, situated towards the upper surface of the head; its horizontal diameter is contained four times in the length of the side of the head: not quite once in advance of the anterior rim of the orbit. A short and flattened tricuspid process may be observed upon the con-

vexity of the preopercle, two of the spines pointing upwards, the third downwards. Upon the inferior branch of the same bone there are two minute spines, whilst a third one, directed forwards, is inserted upon the interopercle.

The general disposition and structure of the fins is the same as in *A. lateralis;* the origin of the anal, however, is opposite the third ray of the second dorsal, and not as deep as the latter is high, and the insertion of the ventrals is situated upon a vertical line intersecting the middle of the base of the pectorals.

D IX, 15; A 10; C 3, i. 5, 4, i 2; VT, 3; P 17.

A membranous flap may be seen upon the posterior superior rim of the orbit. The oçcipital region exhibits small spines and tubercles symmetrically disposed, whilst the entire surface is spread over with small scales similar to those of the dorsal region, with only this difference, that the ciliated or spiny edge is less conspicuous. These scales extend over the temporal region, opercular apparatus and interocular region. The dorsal band or zone has the same disposition as in *A. lateralis*, but is broader, though composed of a lesser number of scales; the latter are more apart, and their edge more strongly ciliated or rather spinous. The lateral line is very conspicuous and its curve quite depressed, upon the middle of the flanks. The ground color is olivaceous, darker above than beneath: a series of four black blotches may be observed, saddle like, along the dorsal region; the first one across the anterior dorsal fin, the second and third over the second dorsal, and the fourth upon the peduncle of the tail between the two fins. The lower half of the sides, below the lateral line, is ocellated with dull white or yellow. The inferior surface is unicolor. The fins are unicolor, of the general hue of the region to which they belong.

Specimens were collected in Tomales Bay.

Plate XXIV, fig. 5 represents this species, size of life. Fig. 6 is a magnified scale.

Plate XXIV, fig. 5, represents, size of life, the species now described. Fig. 6 is a magnified scale from the dorsal zone.

II. GASTEROSTEIDÆ.

7. GASTEROSTEUS PLEBEIUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 147.

Locality. Petaluma, Sonoma Co.

III. ATHERINIDÆ.

8. ATHERINOPSIS CALIFORNIENSIS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 134, 141, 151.
Atherina Storeri, AYRES, Ms.

Plate XXIV, figs. 1–4.

Description. The body is very much compressed, rather slender in its general appearance, and gracefully subfusiform. The greatest depth, taken immediately in advance of the origin of the ventrals, is contained about seven times in the total length; the least depth, on the peduncle of the tail, is about half of the greatest. The head is proportionally small, slightly convex above, and sub-quadrangularly pyramidal, though the sides slope inwardly downwards, thus rendering the inferior plane much narrower than the upper. The snout itself is subconical in its retracted state. Protractile to a certain degree, the mouth, which is moderate in size, preserves nevertheless its horizontal gape; it is the only portion of the head, the preorbital region included, which is deprived of scales, and hence perfectly smooth. The teeth are very exiguous, of the velvet-like type. The tongue is narrow, anteriorly rounded, and perfectly smooth. The anterior nostril is situated midway between the anterior rim of the orbit and the extremity of the snout. The eye is subcircular and of moderate size; its horizontal diameter enters about four times and a half or a little more

in the length of the side of the head. The branchial fissures are continuous under the throat, and prolonged towards the hyoid apparatus. The branchiostegals are five on either side and quite slender. The inter- and subopercle are quite developed.

The origin of the anterior dorsal fin is equidistant between the extremity of the snout and the fork of the caudal fin. It is composed of seven spiny rays, the first of which is the highest. The second dorsal is situated opposite the anal, and since its base is a good deal shorter than that of the latter, the posterior extremities and the anterior margins of these two fins do not coincide with the same vertical line. The rays are thirteen in number, diminishing less rapidly in height than in the anterior dorsal, thus giving the upper margin of the fin a more gradual slope. The caudal fin is deeply forked and contained about six times in the total length, the same as the head. The anal is as deep anteriorly as the second dorsal is high, diminishing, however, very rapidly backwards. The origin of the ventrals is nearer the terminus of the anal than the extremity of the snout; they are composed of five well-developed and dichotomised rays, and a rudimentary undivided one upon their external edge. The pectorals are well developed, posteriorly falciform, and tapering to a point.

Br. VI : VI; D VII, 13; A i, 27; C 5, i, 8, 7, i. 7; Vi, 5; P 15.

The scales are large, constituting but thirteen longitudinal series upon the line of greatest depth of the body. Longer than deep on the dorsal region, and deeper than long on the abdominal region, they are rounded off upon their posterior margin, and truncated upon their anterior margin. Radiating grooves may be seen upon the posterior section of the scale only. The cheeks, opercular apparatus, and the upper surface of the head, are covered with large and imbricated scales, similar to the scales of the body, except that their outline is subjected to infinite variations.

The dorsal region above the silver band is greyish brown, as also the upper surface of the head; the silver band is margined with bluish black; the flanks, sides of head and belly are light brown in the young, and silvery in the adult. The fins are olivaceous throughout.

Locality. Specimens collected in Tomales Bay.

Plate XXIV, fig. 1, represents this fish somewhat reduced in size. Fig. 2 is a view of the inferior surface of the head, size of life. Fig. 3, a scale from the dorsal region. Fig. 4, a scale from the abdominal region.

IV. GOBIDÆ.

9. GOBIUS NEWBERRII, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 136. Plate XXV, figs. 5–8.

Description. This is quite a handsome species, less elongated in its general aspect, and more fusiform in its outline than *G. lepidus.* The largest specimen which we have seen measured but a little over two inches.

The body is compressed, swollen upon the thoracic region, and tapering posteriorly in a very decided manner. The greatest depth is contained about five times and a half in the total length, and the least depth, on the peduncle of the tail, is about one half the greatest.

The head is obtuse, or else the snout is anteriorly rounded so as to give the entire region an obtuse aspect. It is contained four times and a half in the entire length. The jaws are equal and the gape of the mouth is oblique precisely as in *G. lepidus.* The posterior extremity of the maxillary extends to a vertical line drawn back of the orbit. The eye is small, subcircular; its horizontal diameter entering about four times in the length of the side of the head. The interocular space is quite broad compared to the same region in *G. lepidus*, since in specimens a good deal smaller, it is nearly double the width it has in the latter. The branchial fissures are likewise separated under the throat by a wide isthmus.

The first dorsal fin is separated from the second by a narrow space, not contiguous as formerly stated by us. It is also lower. As to its length, it is contained once and a half in that of the second dorsal, measured along their bases. The anal is as deep as the second dorsal is high; it is shorter upon its base, and its anterior margin placed a little posterior to the anterior margin of the latter. Both fins terminate evenly posteriorly, whilst in *G. lepidus* the tips of the posterior rays of the dorsal project further back than those of the anal. These fins have also a proportionally longer base in *G. lepidus* than in the present species. The caudal fin is rounded upon its posterior margin, constituting a little more than the fifth of the entire length. The vent has the same position, opposite the anterior margin of the second dorsal, as in *G. lepidus*, and the tips of the ventral fins are far from reaching it. The latter are subovate, inserted immediately under the base of the pectorals themselves, and their posterior extremity projects beyond that of the ventrals. Thus in the relative position and extension of the pectoral and ventral fins, we have good discriminating characters between this species and *G. lepidus.*

The formula of the fins is as follows:

D VIII, 13; A 12; C 3, i. 6, 6, i. 2; V 5; P 18.

The scales are small and quite inconspicuous; a lateral line, if extant, is not apparent. The scales themselves are subcircular, deeper than long, cycloid in structure, exhibiting diverging furrows upon their anterior margin only. They are smaller upon the upper than upon the lower regions of the body.

The ground color is olivaceous, though the dorsal region appears almost blackish, owing to the accumulation of innumerable black dots which constitute small blotches encircling isolated spots of the ground color. The middle region of the flanks is mottled equally with black. The inferior regions alone being unicolor. The dorsals and

anal are either entirely blackish and margined with white, or else the second dorsal is spotted like the back. The caudal is olivaceous with transverse series of black spots simulating continuous narrow bands. The pectorals and ventrals are unicolor, and rather lighter than the belly and inferior surface of the head. The upper surface of the head presents the same hue as the back.

Locality. Specimens from Tomales Bay.

Plate XXV, fig. 5, represents this species size of life. Fig. 6, the ventral fins. Fig. 7, a scale from the dorsal region. Fig. 8, a scale from the abdominal region.

V. EMBIOTOCOIDÆ.

10. RHACOCHEILUS TOXOTES, AGASSIZ, Amer. Journ. of Sci. 2d Series, XVII. 1854, 367; GIRARD, in Proc. Acad. Nat. Sci. Philad. VIII, 1856, 136.

Locality. Tomales Bay.

VI. CYPRINIDÆ.

11. POGONICHTHYS INÆQUILOBUS, B. & G. Proc. Acad. Nat. Sci. Philad. VII. 1854, 136, VIII. 1856, 188.

Locality. Petaluma, Sonoma Co.

VII. SALMONIDÆ.

12. SALAR IRIDEA, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 220.
Salmo iridea, GIBBONS, Proc. Cal. Acad. Nat. Sci. I. 1855, 36. (Young.)
Salmo rivularis, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1855, 43. (Female.)

Locality. Petaluma, Sonoma Co.

VIII. PLEURONECTIDÆ.

13 PLATICHTHYS RUGOSUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 139, 155.

Locality. Tomales Bay.

14. PLEURONICHTHYS GUTTULATUS. GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137.

Plate XXV, fig. 1–4.

Description. The body is subelliptical, deeper than in *P. cœnosus.* The figure will show its outline better than any description could do. Needless to say that it is very thin.

The head is of moderate size and constitutes about the fourth of the total length. The eyes situated on the right side, are well developed, elliptical, their longitudinal diameter being contained three times in the length of the side of the head. The interocular space is exceedingly narrow and raised, ridge-like, above the surface of the head. The snout is very blunt and short, the mouth small, with its gape oblique upwards, and both jaws even. The posterior extremity of the maxillary corresponds to a vertical line drawn midway between the anterior rim of the orbit and the pupil. The opercular apparatus and cheeks are scaly; the branchial fissures moderate and not continuous under the throat.

The origin of the dorsal fin corresponds to a vertical line drawn immediately in advance of the pupil; it is gradually increasing in height to the line of the greatest depth of the body to diminish again gradually posteriorly, terminating at a small distance from the base of the caudal. The anterior margin of the anal corresponds to a vertical line drawn immediately behind the base of the pectorals. It is shaped like the dorsal, and terminates evenly with that fin. The caudal, which enters about five times in the total length, is rounded upon its posterior margin. The origin of the ventrals is situated in advance of the base of the pectorals, in advance even of the posterior edge of the opercular apparatus; they are small and sublanceolate; their posterior extremity overlaps the vent and reaches the anal

fin. The pectorals themselves are rather small, and directed obliquely upwards and backwards.

D 67; A 47; C 4, i, 8, 7, i, 3; V 6; P 13.

The scales are quite small, longer than deep, cycloid in structure, with diverging grooves upon their anterior section only. The lateral line is slightly arched above the pectorals, thence nearly straight along the middle of the flanks to the base of the caudal fin. A similar mucous line may be traced from the upper rim of the upper eye, along the back, giving off an anastomotic branch to the lateral line across the occipital region, and losing itself in the dorsal fin, beyond the middle of the length.

The ground color is grayish or plumbeous, densely sprinkled all over with black dots and whitish spots; the fins being olivaceous, similarly dotted with black, but exhibiting fewer white spots.

Locality. Specimens were collected in Tomales Bay.

Plate XXV, fig. 1, represents the right side of this species, size of life. Fig. 2, exhibits the left side of the same specimen. Fig. 3, a scale from the dorsal region. Fig. 4, a scale from the abdominal region.

15. PSETTICHTHYS SORDIDUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 142.

Locality. Tomales Bay.

IX. LOPHOBRANCHII.

16. SYNGNATHUS CALIFORNIENSIS, STORER, Proc. Bost. Soc. Nat. Hist. II. 1845, 73, and Synops. 1846, 273. GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137.

Locality. Tomales Bay.

X. RAJIDÆ.

17. RHINOPTERA VESPERTILIO, Girard, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137. Plate XXVI, figs. 1–3.

Description. This species is closely allied to *R. javanica*, from which it differs by the shape or outline of the head, which is semicircular anteriorly and very slightly emarginated, instead of being notched or concave, and by the pectoral fins, which are pointed.

The specimen before us measures nineteen inches and a half from the extremity of the snout to the tip of the tail, six inches and three quarters being the length of the body and head together. The width, from the tip of one pectoral fin to the other, is twelve inches.

The cephalic region is as long as the trunk properly so called; its anterior outline, as already observed, is rounded and but very slightly emarginated. The eyes are quite prominent and somewhat raised above the surface of the head. The lips are fringed, and the edge of the tongue scalloped. The respiratory apertures, five pairs in number, are transversely elongated and disposed upon an open curve.

There is a small dorsal fin situated posteriorly to the ventrals upon the anterior portion of the tail and followed by a lanceolate horizontally flattened spine, serrated upon its edges. The tail is very attenuated, flagelliform, tapering into a filiform extremity.

The color above is of a purplish blue or slate hue, lighter towards the periphery than upon the dorsal region. Beneath dull olivaceous.

Locality. From Tomales Bay.

Plate XXVI, fig. 1, represents this species seen from above and somewhat reduced in size. Fig. 2, is a profile of the head, size of life. Fig. 3, the inferior surface of the head, exhibiting the mouth and branchial apertures, also size of life.

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OFFICERS FOR 1857–8.

PRESIDENT,

Jeffries Wyman, M. D.

VICE-PRESIDENTS,

Charles T. Jackson, M. D. D. Humphreys Storer, M. D.

CORRESPONDING SECRETARY,

Samuel L. Abbot, M. D.

RECORDING SECRETARY,

Benj. Shurtleff Shaw, M. D.

TREASURER,

Nathaniel B. Shurtleff, M. D.

LIBRARIAN,

Charles K. Dillaway.

CURATORS,

Thomas T. Bouvé,	*Of Geology.*
John Bacon, M. D.,	*Mineralogy.*
Charles J. Sprague,	*Botany.*
Thomas M. Brewer, M. D.,	*Oology.*
Henry Bryant, M. D.,	*Ornithology.*
J. Nelson Borland, M. D.,	*Herpetology.*
Silas Durkee, M. D.,	*Entomology.*
Nathaniel E. Atwood,	*Ichthyology.*
Theodore Lyman,	*Radiata.*
Horatio R. Storer, M. D.,	*Crustacea.*
John Green,	*Comparative Anatomy.*

CABINET KEEPER,

Charles Stodder.

CONSTITUTION AND BY-LAWS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

ACT OF INCORPORATION.

Commonwealth of Massachusetts.

In the year of our Lord one thousand eight hundred and thirty-one.

An Act to incorporate the Boston Society of Natural History.

Section 1. *Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same*, That Benjamin D. Greene, George Hayward, John Ware, Walter Channing, Edward Brooks, Amos Binney, Jr., D. Humphreys Storer, Simon E. Greene, Joshua B. Flint, William Grigg, George B. Emerson, and Henry Codman, with their associates, and such other persons as shall from time to time be duly admitted members of the Corporation hereby created, be, and they hereby are constituted a body corporate and politic, by the name of the Boston Society of Natural History, and by that name they shall have perpetual succession, and shall be capable of suing and being sued, of prosecuting and defending unto final judgment, in all Courts and places whatsoever, and may have a Common Seal, with power to change the same at pleasure.

Sect. 2. *Be it further enacted*, That the said Society shall have power to hold real or personal estate by gift, grant, devise, or otherwise, and the same or any part thereof to alien or convey, provided that the clear annual income of such personal and real estate, shall not exceed the sum of three thousand dollars, nor be applied to any other purposes than the encouragement and promotion of the science of Natural History.

Sect. 3. *Be it further enacted*, That said Society shall have power to elect a President and all other necessary officers; to make

rules and by-laws for the election and government of its members, for the management of its property, for collecting annual contributions from its members, for regulating the times and places of meeting, for expelling such members as refuse to comply with the by-laws or regulations, and for the managing of the affairs of the Society, provided such rules and by-laws be not repugnant to the Constitution and Laws of this Commonwealth, or of the United States.

SECT. 4. *Be it further enacted*, That the persons herein before named, or any three of them, shall have power to call the first meeting of the members of said Society, in such manner as they may think proper.

SECT. 5. *Be it further enacted*, That this Act may be altered, amended, or repealed, at the pleasure of the Legislature.

In House of Representatives, February 23, 1831, passed to be enacted.

WM. B. CALHOUN, *Speaker.*

In Senate, February 24, 1831, passed to be enacted.

SAM'L LATHROP, *President.*

FEBRUARY, 25, 1831.

Approved,

LEVI LINCOLN.

A Copy of the Original Act,

Attest,

EDWARD D. BANGS,

Secretary of the Commonwealth.

An Act to authorize the BOSTON SOCIETY OF NATURAL HISTORY to amend its Constitution.

Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same, as follows: —

The BOSTON SOCIETY OF NATURAL HISTORY is hereby authorized and empowered to amend the eighth article of its Constitution, by inserting after the word "members," in the third line of the printed copy thereof, the following words: "present at any two consecutive meetings of the Society, the members having been first duly notified of any proposed alteration."

[Approved by the Governor, April 3d, 1852.]

CONSTITUTION AND BY-LAWS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

CONSTITUTION.

ARTICLE I.

The Society shall be called the Boston Society of Natural History.

ARTICLE II.

It shall consist of Members, Corresponding and Honorary Members, and Patrons.

ARTICLE III.

Members shall be chosen by ballot, after having been nominated at the meeting immediately preceding that on which the ballot is taken: the affirmative votes of *three fourths* of the members present shall be necessary to a choice. Corresponding and Honorary members shall be elected in a similar manner, but *their* nomination shall proceed from the Council. Any person who shall contribute at one time, to the funds of the Society, a sum not less than fifty dollars, shall be a Patron.

ARTICLE IV.

Members only shall be entitled to vote, to hold office, or to transact business: Corresponding and Honorary Members and Patrons may attend the meetings, and take part in the scientific discussions of the Society.

ARTICLE V.

The officers of the Society shall be a President; two Vice-Presidents, first and second; a Corresponding Secretary; a Recording Secretary and Clerk; a Treasurer; a Librarian; —— Curators, and a Cabinet Keeper; who, together, shall form a Board for the management of the concerns of the institution, and be called the Council.

ARTICLE VI.

Officers shall be chosen by ballot, and a majority of votes shall be sufficient for a choice.

ARTICLE VII.

By-laws, for the more particular regulation of the Society, shall from time to time be made.

ARTICLE VIII.

This Constitution may be altered or amended in any of the preceding articles, by a vote to that effect, of three fourths of the members present at any two consecutive meetings of the Society, the members having been first duly notified of any proposed alteration: but the article which immediately follows this shall be unalterable.

ARTICLE IX.

The consent of every member shall be necessary to a dissolution of the Society. In case of a dissolution, the property of the Society shall not be distributed among the members, but donors may claim and receive such donations as they have made to the museum, and the remainder shall be given to some public institution, on such conditions as may then be agreed on; and the faithful performance of such conditions shall be secured by bonds, with sufficient penalties for the non-fulfilment thereof.

BY-LAWS.

SECTION I.

OF MEMBERS.

Art. 1. Every person who shall have been elected a member of this Society, shall subscribe an obligation, promising to conform to the Constitution and By-laws thereof, and shall pay into the treasury an initiation fee of five dollars. He shall possess none of the rights of membership, nor shall his name be borne upon the roll of members until the said fee shall have been paid. Any person of respectable character and attainments, residing in the city of Boston or its immediate neighborhood, shall be eligible as a member of this Society.

Art. 2. Corresponding and Honorary members shall not be required to pay an initiation fee, or other contribution. Corresponding members shall consist of persons not resident in the city, who may be interested in the study of Natural History, or desirous of promoting the interests of the Society. Honorary members shall be selected from persons eminent for their attainments in science, on whom the Society may wish to confer a compliment of respect.

Art. 3. Persons who have been unsuccessful candidates for admission, shall not be again proposed as members until after one year.

Art. 4. Any member may withdraw from the Society, by giving written notice of his intention, and paying all arrearages due from him. A refusal or neglect on the part of a member to pay any due for the space of one year, shall be considered an intimation of a wish to withdraw from the Society; and it shall be the duty of the Treasurer to report the names of such delinquent

members yearly to the Council, at their first meeting after the annual meeting, who may thereupon order their names to be stricken from the rolls.

Art. 5. Members may be expelled from the Society, by a vote of three fourths of the members present, at a meeting specially called for that purpose, by a notice given at least one month previous.

SECTION II.

OF OFFICERS AND THEIR DUTIES.

Art. 1. The President shall preside at meetings of the Society and of the Council; shall preserve order, regulate debates, and announce donations and other interesting information.

Art. 2. The Vice-President shall perform the duties of President, in his absence.

Art. 3. The Corresponding Secretary shall conduct the correspondence of the Society, and keep a record thereof; shall keep the common seal; acknowledge all donations; notify corresponding members of their election, and receive and read to the Society all communications on scientific subjects which may be addressed to him.

Art. 4. The Recording Secretary and Clerk shall take and preserve correct minutes of the proceedings of the Society and Council, in a book to be kept for that purpose; shall have the charge of the papers and documents belonging to the Society; shall notify members of their election, and committees of their appointment; shall call meetings when directed by the President; and shall give written notice to the Treasurer and Corresponding Secretary of all matters which shall occur at any meeting requiring the action of those officers.

Art. 5. The Treasurer shall have charge of all moneys and other property of the Society, except their Library and Museum; shall collect all fees and assessments, and receive any donations in money which may be made to it; shall pay all accounts against the Society, when the same are approved by a vote of the Council; shall keep a correct account of all receipts and expenditures in a book belonging to the Society, and shall, at each annual meeting, and at other times when required by the Council, make a detailed report of the same.

Art. 6. The Librarian shall have control of the books belonging to the Society, or deposited for their use; he shall make a correct catalogue of them, and keep a record of such as are taken from the Library by the members; shall permit the use of the Library to members and others, under such regulations as may from time to time be adopted, and shall annually report the condition of the Library.

Art. 7. The Curators shall be intrusted with the care of the Museum. They shall, within six weeks after a donation is made, deposit such donation in their particular Cabinets. Each Curator shall have his particular department allotted to him at the time of his election. The Curator having charge of any division of the collection, shall keep the keys thereof; shall arrange the specimens after some approved system, and, so far as is practicable, label them with the names they bear in such system. He shall keep a correct catalogue of articles in his care, and shall be alone authorized to select duplicate specimens from the Cabinet, and effect exchanges. He may select from among the members of the Society a person to assist him in arranging and labelling the specimens. The Curators shall, at the annual meeting, make a written report to the Society, concerning the Museum, the state of the different Collections, the additions made during the past year, and the deficiencies which exist.

Art. 8. The Cabinet Keeper shall have the general charge of the room or rooms belonging to the Society; shall see that their contents are kept in the best order; shall select a competent person as a porter or attendant, and this person shall be considered as under his immediate control. He shall keep the Donation Book, and see to the execution of the duties enjoined in Art. 4, Sec. 5. He shall also, when convenient, attend personally, during the days of public visitation.

Art. 9. The Council shall provide suitable rooms for the meetings of the Society, for lectures, and for the Museum; they shall select the subjects of the lectures, regulate the order in which they shall be given, and determine on what terms the public may be admitted to them; appoint Lecturers, and fix their compensation; authorize the expenditure of money for the increase of the Library and Museum, and designate the books which shall be purchased; and do any other acts not inconsistent with the Constitution and

By-Laws, which they may think necessary to the continuation and success of the Society.

SECTION III.

OF ASSESSMENTS.

Art. 1. Every member who shall have resided in the city of Boston, or within ten miles thereof, during the six months preceding the first of October in each year, or during any part of said term, shall be subject to an annual assessment of three dollars, payable on that day; Provided, that no assessment shall be required of any member during the six months succeeding his election.

Art. 2. Any member who shall pay into the treasury at one time, the sum of thirty dollars, shall be exempt from the annual assessments.

Art. 3. Whenever a member of this Society shall become acquainted with a young man of good moral character, who is desirous of joining the Society from a pure love of Natural Science, and shall be aware of his inability to become a member should an initiation or assessment fee be demanded, — he shall be allowed to nominate the said individual in the usual way, sparing his feelings by making no reference to his situation. But in case of his election, he shall state his situation to the Treasurer, and pledge the honor of the individual elected, that all the fees which would ordinarily be demanded, shall be promptly paid, except arrears, whenever his situation will allow; and the Treasurer shall make known his circumstances to no one save his successor, who shall as carefully guard his feelings.

SECTION IV.

OF THE LIBRARY.

Art. 1. The Library shall consist of works on Natural History, and other subjects connected therewith.

Art. 2. The selection of books to be purchased for the Library shall be made by the Council; but for the present, such books as are not found in other public Libraries in the city of Boston, shall be purchased in preference.

Art. 3. Members may deposit books in the Library for the use of the Society; but such books shall not be taken from the Library-room, without the consent of the owners.

ART. 4. The Society shall be responsible for the safe-keeping and careful usage of books deposited, and shall recompense the owners for any damage which may occur to them while in the Society's keeping.

ART. 5. Books owned by the Society may be taken from the Library by members, upon signing a receipt for the same, and promising to make good any damage which may be sustained when in their possession, and to replace the same if lost.

ART. 6. The Council may prohibit valuable and rare books from circulation.

ART. 7. Books shall not be kept from the Library more than one calendar month, by the same person, without renewing the loan.

ART. 8. The Council may appoint particular days for taking books from the Library.

ART. 9. All books shall be returned to the Library on the third Wednesday of April, annually, and remain one fortnight; and any person having then one or more books, and neglecting to return the same, shall be reminded of his delinquency by the Librarian.

ART. 10. The Council may extend the use of the Library to other persons than members.

SECTION V.

OF THE MUSEUM.

ART. 1. The Museum shall consist of collections in the different departments of Natural History.

ART. 2. All specimens sent to the Museum shall be considered the property of the Society, unless the owner shall make known in writing his wish to retain the privilege of withdrawing them.

ART. 3. When a member deposits in the Museum a sufficient number of articles to fill an entire case, a key of the case shall be at all times at his command.

ART. 4. The names of donors, with the articles given, shall, in every instance, be recorded in a book kept for that purpose, by the Cabinet Keeper, under the direction of the Curators of each department.

ART. 5. No specimens shall be removed from the Museum, without the leave of the Curator of the department to which they

belong, who shall take a receipt for the same, and give notice thereof to the Cabinet Keeper, and be himself responsible for the restoration of the same in good order.

Art. 6. Members, Honorary and Corresponding Members, and Patrons, shall have access to the Museum at all times, and the public occasionally, subject to the regulations of the Council.

Art. 7. Members or other persons desirous of examining or describing specimens, or of taking them from the cases for the purpose of study, must apply to the Curators who have charge of them, who may grant such request at discretion.

SECTION VI.

OF LECTURES.

Art. 1. Public lectures, when judged expedient by the Council, shall be given under the auspices of the Society, on the several branches of Natural History.

Art. 2. The order in which the lectures shall follow each other, shall be fixed by the Council.

Art. 3. Members of the Society shall have free admission to the lectures; other persons shall be admitted on such terms as the Council shall prescribe.

Art. 4. The moneys received for admission to the lectures shall go to pay the compensation of Lecturers and other expenses; the balance, if any, shall be paid into the Treasury of the Society.

SECTION VII.

OF MEETINGS.

Art. 1. A meeting shall be held on the first Wednesday in May annually, for the choice of officers and other general purposes. At this meeting, or at a subsequent meeting, if so ordered by a vote of the Society, reports shall be made, by the Treasurer, on the state of the Funds; by the Librarian, on the condition of the Library; and by the Curators, on the condition of the Museum.

Art. 2. Stated meetings of the Society shall be held on the first and third Wednesday of every month.

Art. 3. Six members shall form a quorum for business.

Art. 4. Members will be expected to communicate at the meetings of the Society, such interesting information as may come into

their possession respecting Natural History in general, and particularly any new facts respecting that of our own country.

Art. 5. Written communications on subjects connected with Natural History, may be made by the members; the subjects, and time of reading, shall be chosen by themselves; but after the same shall have been read, the opinions and facts therein contained, shall be open to remark by other members.

Art. 6. The order of proceeding at meetings shall be as follows, to wit:

1. Record of preceding meeting read.
2. Written communications read.
3. Verbal communications made.
4. Business called up by special resolutions.
5. Donations announced.
6. Candidates for membership proposed.
7. Adjournment.

J. Thomas sc.

Pl. XII.

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A. Frey Eng.

T. Sinclair's lith. Phil^a.

A. Schonborn. Del A. Frey Eng. T. Sinclair's lith. Phila

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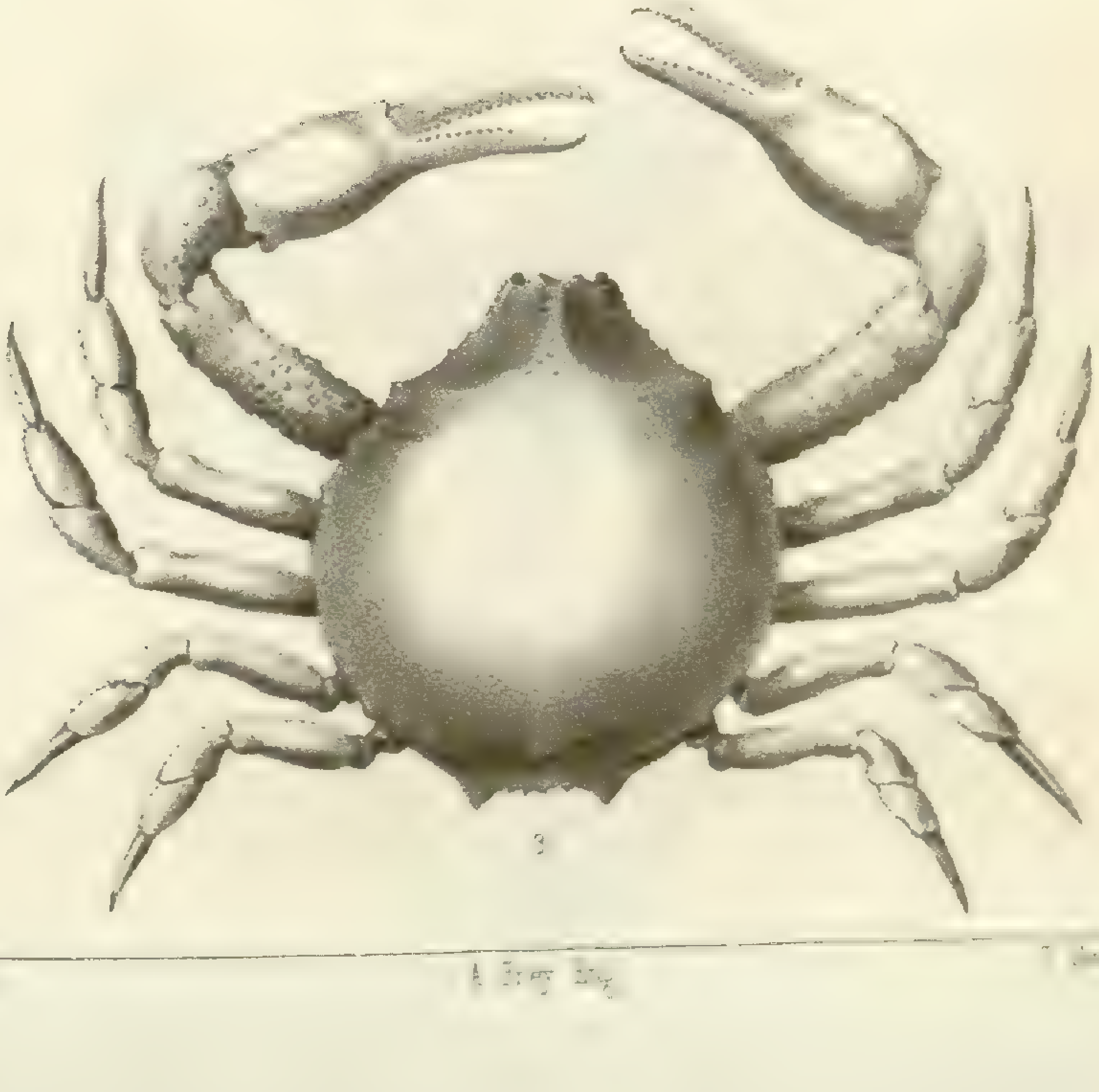

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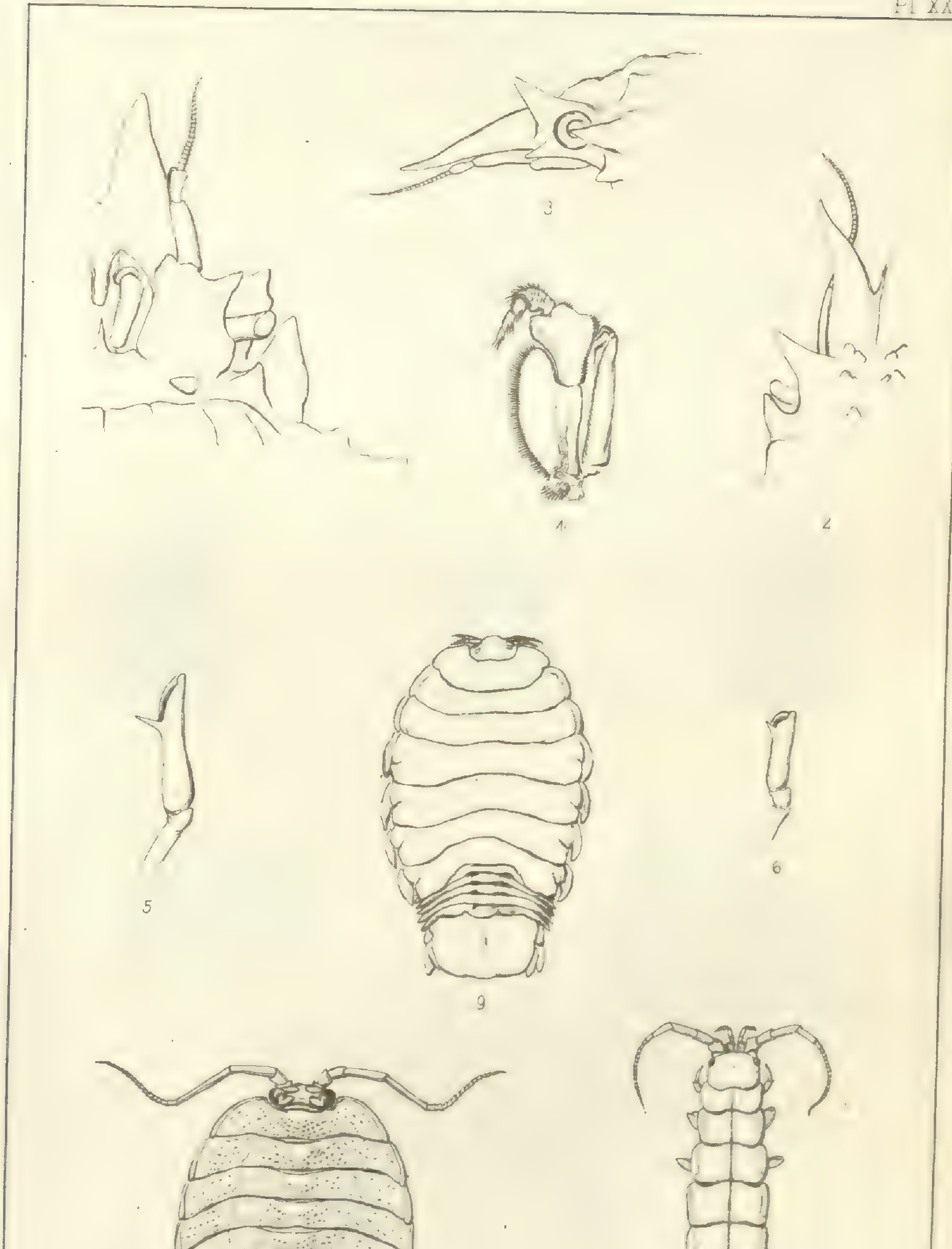

W S Del
A Bigot, fec
T Sinclair's lith, Phil^a

Richard Del.

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F[illegible] 7. Oligocottus maculosus Grd.

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BOSTON
JOURNAL OF NATURAL HISTORY,

CONTAINING

PAPERS AND COMMUNICATIONS,

READ BEFORE THE

Boston Society of Natural History,

AND PUBLISHED BY THEIR DIRECTION.

VOL. VI.—NO. III.

PUBLISHING COMMITTEE.

D. HUMPHREYS STORER,
CHARLES K. DILLAWAY,
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BOSTON:
GOULD AND LINCOLN.
59 WASHINGTON STREET.
1853.

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JOURNAL OF NATURAL HISTORY,

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Boston Society of Natural History,

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VOL. VI.—NO. IV.

PUBLISHING COMMITTEE:

D. HUMPHREYS STORER, | SAMUEL L. ABBOT,
CHARLES K. DILLAWAY, | JEFFRIES WYMAN,
BENJ. SHURTLEFF SHAW.

BOSTON:
PUBLISHED BY GOULD AND LINCOLN.
59 WASHINGTON STREET.
1857.

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